January 1993 Issue #18

Radio Fun

BULK RATE
U.S. POSTAGE
PAID
PERMIT #1
MANCHESTER, NH

$2.00

"The beginner's guide to the exciting world of amateur radio."

in this issue

features

4 Wire Your Shack for 12 Volts N1II
8 Movable Antenna Supports W2HZF
16 STS-47 SAREX KC4YER

vintage review

10 The ICOM IC-701 All-Band All-Solid-State Transceiver N8RK

departments

24 Activities Calendar Staff
17 Ad Index Staff
22 Antennas, Etc. K4IPV
28 Flea Market Staff
5 Letters Staff
28 New Products Staff
21 Radio Magic WB8VGE
12 The Tech Side KB1UM
29 Uncle Wayne's Bookshelf Staff
30 Updates Staff
14 Upgrade . . . Don't Stop Now WB6NOA
26 What's Next? WB2MGP

Southwest Ohio Amateurs Recognized for Lifesaving Efforts

Five Southwest Ohio amateurs have been recognized by the ARRL for their efforts in helping to save the life of a Chicago truck driver on August 3, 1992. Jim Weaver K8JE, Phil Kelly WB8X, Vic Stauder N8FPF, Shirley Roberts N8JHW and Terry McCray N8SPV all received Commendation Certificates for their part in locating and bringing help to Mike Smith N9EXR.

Mike, the driver of a semi trailer truck, became ill and was losing consciousness when he pulled off Interstate 70 and onto an exit ramp and called for help on his 2 meter rig. His call was heard by Jim K8JE on the Fairfield ARA repeater. He, in turn, called for help from Dayton area amateurs. Phil WB8X was the first to respond and called for police and medical assistance. Shirley N8JHW also heard the call and recognized the general area as being close to her home. She could hear Mike's now intermittent transmissions on the input. A call was made to Vic N8FPF, also in the general area, to alert him and ask if he could assist in locating Mike. Vic agreed and, with DF equipment, headed up Rt. 49, where Mike was believed to be located. Stopping at numerous parked semis, Vic finally located Mike. The truck was off the exit ramp and partially obscured by trees. The rescue teams arrived almost simultaneously. The State Highway Patrol and other emergency units had passed by several times without noticing the truck. Mike was only semi-conscious when found. He was treated at the scene and then rushed to Good Samaritan Hospital in Dayton.

Apparently, infected teeth had been slowly poisoning Mike's body. Shirley maintained contact with Mike as he recovered and was safely on his way home.

(Left to right):Phillip Kelly WB8X, Vic Stauder N8FPF, Shirley Roberts N8JHW and Terry McCray N8SPV receive recognition certificates for their lifesaving efforts in the rescue of truck driver Mike Smith N9EXR.

Terry N8SPV, a member of the Randolf Township Medical Team, reported that from the position of the truck, it probably could have gone unnoticed for some time. Terry feels that without the call for help which started the search and the rapid response, Mike might not have survived.

Mike is now home in Chicago, has had oral surgery and is recovering. He is most appreciative of the help from the hams. All in all, it was a complicated, involved operation which once again proved the value of our amateur repeater systems and the dedicated amateurs ready to be of service when needed.

Ron Moorefield W8ILC, ARRL Emergency Coordinator, presented the certificates at the Dayton Amateur Radio Association meeting on September 4, 1992. *TNX Dayton Amateur Radio Association.*

WAØQIT's station has always been open to students for a "hands-on" experience. Pictured in his ham shack is Les (right) helping his latest student, Ron Wood KB9HKB, make a contact on HF packet.

A Quarter Century of Teaching Amateur Radio

Les Taylor WAØQIT has been teaching amateur radio, individually and in classes, to people in the Duluth, Minnesota/Superior, Wisconsin, area for 25 years.

He has tested more than 350 prospective hams in this length of time. Many of the ex-students have moved out of the area and some have let their licenses lapse, but a count of the present ham population within a 25-mile radius of Duluth/Superior shows that 25% of area hams were first licensed through Les.

Earthwinds Setback

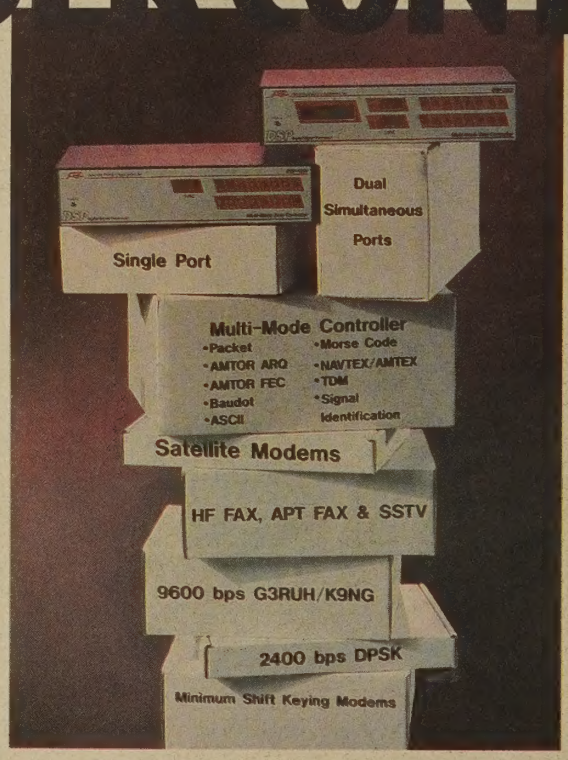
The Earthwinds attempt to circumnavigate the world non-stop in a manned capsule suspended between two special balloons has suffered a setback just days before a scheduled liftoff. During a media tour of the launchsite near Reno, Nevada, a 29 mph wind gust ripped a hole in the top of the large inflatable dome that served as a hangar for the project. The dome quickly deflated, exposing the 100-foot diameter anchor balloon (already inflated in preparation for liftoff) to the high winds. The anchor balloon broke free from its moorings and rolled nearly a half mile across the desert floor until it deflated after suffering damage from the sagebrush. Fortunately no one was hurt and the gondola only experienced minor damage. The top balloon was still in its packing crate and was undamaged.

The anchor balloon will have to be either repaired or replaced. In addition, a new hangar dome will have to be installed. It is expected that repairs should be completed in time for a resheduled launch attempt as early as January 1. This still gives the Earthwinds crew a two-month launch window.

During this historic flight, look for the ham radio tracking experiment on 28.303 MHz. There will be a transmission giving the balloon's latitude, longitude and ground speed at 30 and 55 minutes past each hour during the flight. The callsign will be KB7JGM. *TNX to Bill Armstrong and Erin Porter of the Earthwinds Hilton project for the above information.*

WE'VE GOT EVERYTHING UNDER CONTROL

FREE "GET STARTED in PACKET" book with purchase of any AEA packet controller!
Good 10/1/92 – to – 2/28/93



In the world of multi-mode contollers, nothing tops the DSP-2232 or DSP-1232 from AEA. When you choose either the dual port DSP-2232 or single port DSP-1232, you'll have just what you need to couple HF or VHF/UHF (or both) transceivers with a personal computer or computer terminal. Each converts incoming analog signals into digital data by means of a 12-bit, high speed converter.

Developed by AEA — with over 10 years of multi-mode controller development experience — the DSP-2232/1232 are the most advanced and versatile controllers available anywhere. They give you the capability to control all legal Amateur digital modes popular on both HF and VHF. New modems only require new software which can be installed with an EPROM chip, or downloaded from a telephone BBS binary file into the DSP's RAM. You won't need to replace your DSP-2232 or DSP-1232 as no new hardware or modifications will be needed as new modes become available.

Whatever you've thought about doing in Amatuer radio, it's here in the DSP-2232 /1232. All PK-232 MBX modems (Packet, AMTOR, etc.). All satellite modems (PSK, 4800 bps PACSAT, G3RUH 9600 bps, U022 equalized, 400 bps OSCAR-13). Analog modems for HF FAX, FAX APT, and SSTV. 9600 bps K9NG/G3RUH for terrestrial and satellite use. Each also offers internal RAM for uploading modems, up to 36 simultaneous packet connections, EPROM up to 2 Mbits, software selectable radio ports, Mailbox accessible through both ports, dedicated printer port, RTTY digital noise gate, ARQ tolerance command, etc.

The DSP-2232 adds even more control with its dual port gateway, front panel LCD showing connect and packets status, retrieval, call sign connected to, last call monitored and "marquee" display of received RTTY signals.

Get control of your digital operating position with the DSP-2232 or DSP-1232 from AEA. You'll be on top of the Amatuer radio world, too.

To connect with the AEA dealer nearest you or for product sheets, call (800) 432-8873.

Advanced Electronic Applications, Inc.
PO Box C2160, 2006 - 196th St. SW, Lynnwood, WA 98036 Sales: (206) 774-5554

Connect with us

DARA Scholarships

The Dayton Amateur Radio Association, Inc. is once again offering scholarships to hams graduating from high school in 1993. Eight scholarships are offered, at $2,000 each (up from $1,500 each in previous years). There are no restrictions on the course of study planned by the student, and a four-year baccalaureate degree program is not required. However, schools awarding Associate degrees and technical institutions must be accredited.

The awards will be based on a combination of financial need, scholastic achievement, contributions to amateur radio and community involvement. Applications must be postmarked no later than May 15, 1993, and award winners will be notified by telephone around June 1, 1993. For an application, contact: DARA Scholarship Committee, 45 Cinnamon Court, Springboro OH 45066-1000.

Mexican Border Agreement

The FCC, Dept. of State, and the National Telecommunications and Information Administration (NTIA) have finalized an agreement with the Mexican Secretariat of Communications and Transportation for operating 220-222 MHz Land Mobile radio stations along their common border. The U.S. and Canada will each gain access to 97 primary channels within 120 kilometers of the border. Channels allocated for primary Mexican use may be assigned to U.S. licensees on a secondary non-interference basis. The 220-222 MHz band was reallocated from shared-amateur to narrow-band business use in August 1988. *TNX W5YI Report, Vol. 14, Issue #22, November 15, 1992.*

Maximum Reimbursement Fee for Amateur Exams

The FCC has announced that, effective January 1, 1993, the maximum allowable reimbursement (testing) fee for an amateur license examination will be $5.60. This amount is based on a 3.0% increase in the Department of Labor Consumer Price Index between September 1991 and September 1992.

Volunteer Examiners (VEs) and volunteer-examiner coordinators (VECs) may charge examinees for out-of-pocket expenses incurred in preparing, processing, administering or coordinating examinations for Technician, General, Advanced and Extra class operator licenses.

The amount of any such reimbursement fee from any examinee for any one examination session, regardless of the number of elements administered, must not exceed the maximum allowable fee. Where the VEs and the VEC both desire reimbursement, they jointly decide upon a fair distribution of the fee.

No fee is allowed to be charged for the Novice class license examination.

This announcement is made pursuant to Section 97.527 of the Commission's Rules 47 CFR 97.526. *FCC Public Notice released Oct. 30, 1992, Washington DC. TNX W5YI Report, Vol. 14, Issue #22, November 15, 1992.*

The Origin of "Ham"?

Tony Smith G4FAI has come up with another version of the origin of the term "ham." A magazine from the early 1900s, called *Home Amateur Mechanic*, published details on how to build the *Home Amateur Mechanic* radio. Thus, those who built and used those sets became known as HAM radio operators.

He also mentions that while the U.S. went "No-Code" in 1991, the United Kingdom went "Novice." As of March 1992, there were 33,280 Class "A" (Code) amateurs, 27,738 Class "B" (No Code) amateurs, 46 "A" Novices and 378 "B" Novices in the U.K.—a gain of 568. (There were also 64,944 licensed CBers.) *TNX W5YI Report, Vol. 14, Issue #22, November 15, 1992.*

THE CATALOG OF BARGAINS!

Order the ***one and only book*** that opens the world of amateur radio mail order bargains. Our third year. Discover who's who in the world of amateur radio mail order! **PLUS**...the huge RESOURCE DIRECTORY includes a List of 100+ Free Catalogs, a list of 85 BBS's, Clubs, a Directory of Worldwide QRP Clubs, the HAM-SOFT Shareware Catalog, and much more. ALSO...included this year is the *W6DDB Library of Tips for Hams*. Here are some of the 203 categories in the 300 pages of the 1993 AMATEUR RADIO MAIL ORDER CATALOG AND RESOURCE DIRECTORY:

Alternative Energy
Amateur Television
Antennas
Antenna Duplexers
Associations
Auto Tags
Award Plaques
Balloons, Blimps
Badges, Batteries
BBS Listings
Beam Headings
Belt Buckles
Books
Books, Braille
Books, Soviet
Bumper Stickers
Calendars
Classified Ad Publications
Computer-to-Rig Interfaces
Crystals
Digital Frequency Display
Digital Signal Processing
Direction Finding
Directories
Duplexers
DX Guides
Embroidered Caps
Emergency Supplies
Filters
Frequency Converters
Frequency Counters
Headphones
Hurricane Tracking
ID, Morse Code
Iron Powder & Ferrite
Keyers, Kits, Lasers
Linear Amplifiers
Magazines, Manuals
Meters
Modifications, Mugs
Newsletters
Online Directories
Software, Amiga
Software, Apple
Software, Commodore
Software, PC
Study Guides
Surveillance
Tools, Transverters
TVI filters
Used Equipment
Video Cams
Weather Instruments
Wire & Cable

[ ] YES! I need to know Who's Who In the Business of Amateur Radio. Send me the 1993 *AMATEUR RADIO MAIL ORDER CATALOG & RESOURCE DIRECTORY and Ham-Soft Shareware Catalog.*

Name _____

Street Address or PO Box _____

City, State, ZIP _____

USA residents, please enclose $14.95+$3.00 shipping and handling, US Funds. Foreign customers, please enclose $14.95+$6.00 ground shipping, US Funds. USA customers: your copy of the 1993 *Amateur Radio Mail Order Catalog and Resource Directory* will be shipped two-day priority mail the day your payment is received. Foreign customers: your copy will be shipped First Class mail. If you prefer airmail delivery, please ask your local post office for airmail rates from USA to your destination, and enclose additional US Funds for the amount.

MAIL THIS COUPON OR PHOTOCOPY TO:
HART PUBLISHING
767 SO. XENON CT,
#117RF
LAKEWOOD, CO 80228
303.987.1211

CIRCLE 300 ON READER SERVICE CARD

Wire Your Shack for 12 Volts

A power supply system that is ready for any emergency.

by Paul Danzer N1II

By the time you have been a ham for a few months or more you have probably gathered a collection of small accessories for your shack, all of them requiring 9 to 12 volts DC to operate. In addition, from time to time you probably bring your mobile rig into the shack.

The easiest way to run the rig, as well as all of these accessories, is to have a good and stable source of 12 volts available whenever the need arises.

When I planned my shack I decided to install a 12-volt 10-ampere regulated power supply—but then I realized that for a similar cost I could have the 12 volts available for emergency use whenever the power line failed.

This led to the system shown in Figure 1, where the supply is a 12-volt automotive battery. The battery is recharged by a trickle charger, and the charging cycle is controlled by a timer.

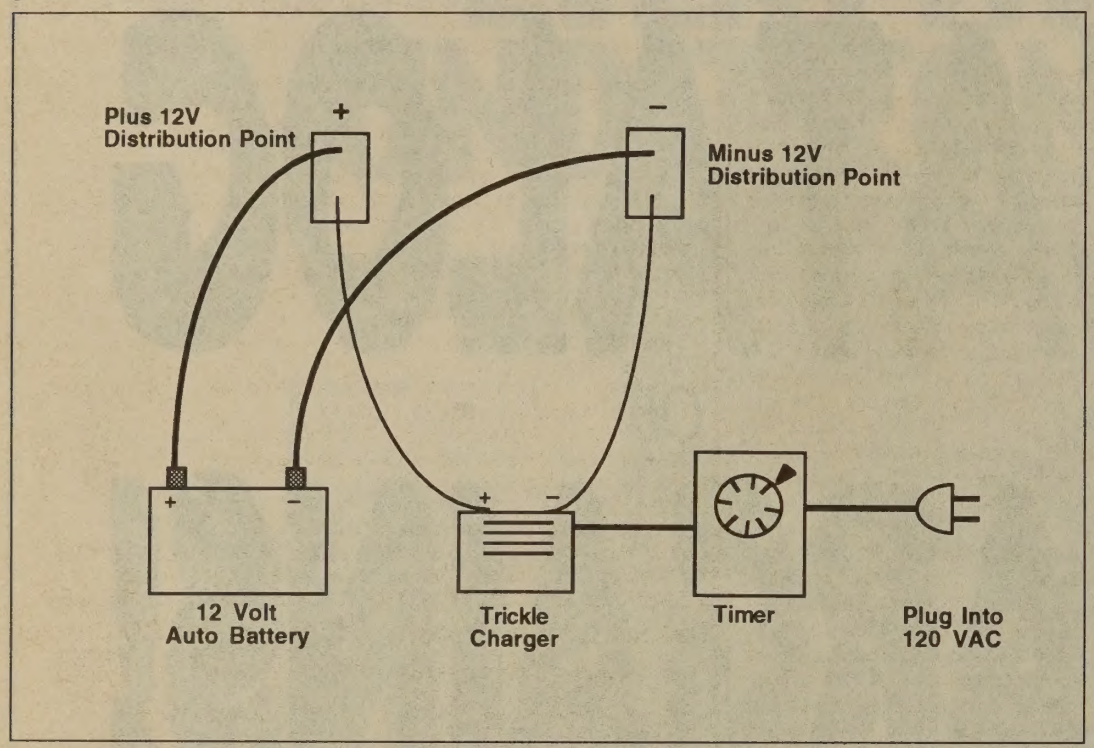


Figure 1. A 12-volt supply power system for your hamshack.

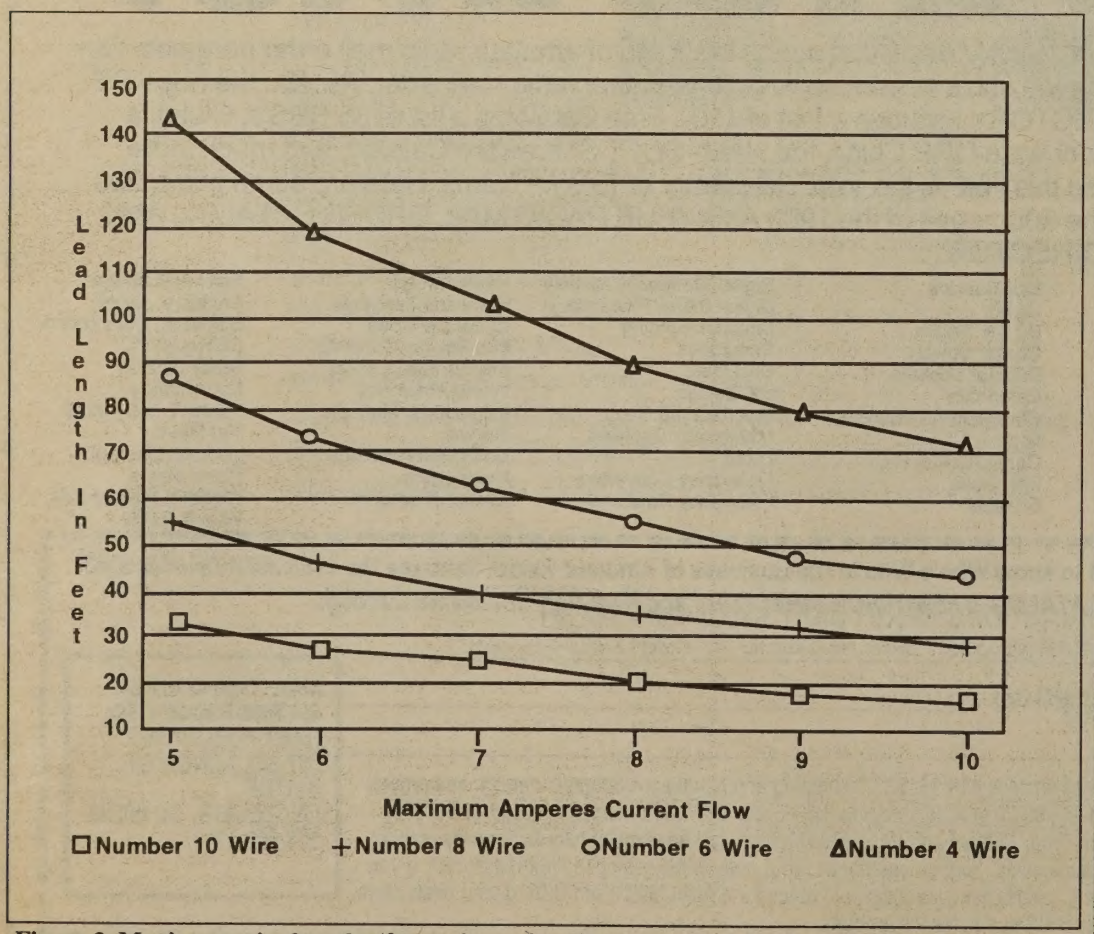


Figure 2. Maximum wire lengths (for various wire diameters) from the battery to your hamshack.

Which Battery and Where Do You Put It?

An inexpensive automobile battery is a very good solution, with one requirement: It cannot be put in a closed room where there is no fresh air. These sulfuric-acid-based batteries put out small amounts of fumes as well as some hydrogen when they are charging. As a result, to avoid problems the battery should be put in either a garage, a ventilated crawl space or attic, or a room which has a dependable supply of fresh air.

For most people, this means running the leads to the battery some distance. Assuming we are willing to accept a 1-volt drop from the nominal charged battery voltage of 13.5 volts to the value at the load (worst case) of 12.5 volts, we have a total of 1 volt which can be dropped in the connecting leads under maximum load.

Figure 2 shows how long the leads can be for several wire sizes. If you think that you will have no more than 50 feet between the battery and your shack, and at any one time draw no more than 10 amperes, the curve says that you can use #6 wire or larger.

Various wire sizes are available for home wiring at electrical supply stores either as insulated single wires, in plastic-covered cables ("ROMEX"), or in metallic-covered shields ("BX"). You can use any of these with or without the ROMEX covering or BX covering.

Connect the leads to the battery with a car battery clip such as you see on jumper cables. You can get these at any automotive store or use Radio Shack part #270-342. Incidentally, if the distance from the battery to the shack is under 10 feet, it might pay to buy a set of inexpensive jumper cables, cut the clips off one end, and use the cables and remaining clips to connect the battery to the distribution terminals.

Keeping the Battery Charged

An inexpensive charger, available for less than $25 in an automotive store, is capable of keeping the battery charged. These devices usually provide less than 1 amp charging current maximum, which is more than enough for most purposes.

Purists will object to keeping the trickle charger connected all the time since this will lead to overcharging the battery. To some extent they would be right, except that the trickle charger is controlled by a timer such as Radio Shack part #63-862 (see Figure 1). This tiny unit controls 15 amps and sells for less than $10.

Setting the ON cycle on the timer to three hours per night is a good starting point. If you notice that the battery voltage is less than 13 volts in the morning after use and recharge, increase the ON time an hour each time until you are able to keep the battery between 13 to 13.5 volts under the cycles of use and recharge.

My experience has been that the life of these batteries is three to four years with this type of cycle. The battery is located in the garage during both the summer and the moderately cold Connecticut winters. Occasionally I use the same battery for an electric trolling motor for fishing, and when I return home reconnect the battery for the shack.

Distributing the Power

Figure 3 illustrates how the power is wired and used in the shack. A monitoring voltmeter is connected to the terminal strip, as are the leads from the charger and the leads to the battery. Be very careful that the positive charger lead goes to the positive lead from the battery. CHECK THIS CONNECTION AND RECHECK IT BEFORE YOU PLUG THE CHARGER IN!

You can home-brew the voltmeter by taking any small milliampere meter and a variable resistor so that the meter acts as a voltmeter. Alternately, there are several inexpensive voltmeters around. Radio Shack sells one with a scale of 0 to 15 volts for about $8, part #270-1754.

Terminal strips are used to distribute the 12 volts throughout the shack. Each device needing 12 volts is connected to the strip. Don't be afraid to use fuses. An in-line fuse holder is illustrated in Figure 3. This holder places a fuse in series with the plus-12-volt lead to the device you are powering.

Almost any terminal strip which has large terminals, for large wire, will serve. Jumper half of the terminals together for the positive connections, and half together for the negative connections. Alternately, you can get two smaller strips and use one for positive and one for negative.

The in-line fuse holders are available in two varieties. One type accepts the newer automotive "blade" fuses, and is available as Radio Shack part #270-1213. The other type, part #270-1211, accepts the older round glass fuses.

Fuses also obey Murphy's Law. They blow out when all of the stores are closed, and they are always of a value which is not to be found in your junk box. For that reason, I have been using the newer blade fuses—there is usually a 24-hour gas station open on the nearest interstate highway and they have a collection of these fuses.

For small accessory circuits, a 1-amp fuse is acceptable. It won't protect the accessory from problems but it will keep the battery from being drained by a short in the accessory.

To protect a small accessory, you must use a fuse which is just slightly larger than the amount of current the accessory requires, and even here in most cases the fuse will not blow fast enough to protect the device.

Murphy's Law predicts that transistors and integrated circuits will blow faster than fuses whenever there is a problem, so the best you can do is protect the power supply—here the battery circuit.

For large loads, such as your mobile rig, use the fuse size that comes with the rig. Most rigs already have an in-line fuse holder built in so you do not have to add another.

If you want to be really sophisticated you can set up a series of outlets for the 12-volt power source so that various devices just plug in. Don't be tempted to use standard 115 house wiring plugs and sockets since they will lead you into plugging 115 devices into the 12-volt supply—with occasionally disastrous results.

Even though the 12-volt supply is a lower voltage than the 115 volts AC found in the home, it is DC and a transformer-operated device—even a small one such as a tensor desk lamp—can burn up when DC is applied to the transformer.

Continued on page 6

Radio Fun

JANUARY 1993
issue #18

editor/publisher
Wayne Green W2NSD/1
associate publisher
David Cassidy N1GPH

managing editor
Bill Brown WB8ELK
production editor
Hope Currier
editorial associates
Sue Jewell
Joyce Sawtelle
contributing editors
Mike Bryce WB8VGE
Joseph E. Carr K4IPV
Michael Geier KB1UM
Carole Perry WB2MGP
Jeffrey Sloman N1EWO
Gordon West WB6NOA

advertising sales representatives
Dan Harper
Sue Colbert
advertising coordinator
Judy Walker

1–603–924-0058
1–800–274-7373
FAX (603) 924-9327

graphic design
Suzanne Self
desktop page make-up
Linda Drew
Alice Scofield

circulation manager
Harvey Chandler
subscription services
1-800-257-2346

Wayne Green, Inc.
editorial offices
Radio Fun
70 Route 202-North
Peterborough, NH 03458
(603) 924-0058
FAX: (603) 924-9327

RADIO FUN (ISSN 1055-887X) is published monthly by Radio Fun, a division of Wayne Green, Inc., 70 Route 202-N, Peterborough NH 03458. Subscriptions: $14.00 per year. Canada add $8.00. Foreign add $12.00 surface/$32.00 airmail. Second class postage pending at Peterborough NH and additional mailing offices.

POSTMASTER: Send address corrections to RADIO FUN, P.O. Box 4926, Manchester NH 03108.

Entire contents ©1992 by Radio Fun. No part of this publication may be reproduced without written permission of the publisher.

letters

Write to: Radio Fun, 70 Route 202-N, Peterborough, NH 03458

Keith Littlejohn KA6PCD, from the *73/Radio Fun* BBS I was in a certain California border city last week (San Diego), and I found myself unable to get into ANY of the repeaters I heard from the downtown area! There were plenty of repeaters to be heard, but ALL were using subaudible tones, which my HT doesn't produce.

This led to some amount of amusement on the part of a friend who had finally agreed to sit down and listen to my proselytizing for ham radio. I told him about the many fun activities, and bragged about the way my HT could get me help if I needed it—and how about a demonstration? It's a good thing I DIDN'T need help! The scan function of my Yaesu FT-23R found several repeaters in use—but none were open! I am still scraping egg off my face! It also makes me think that the repeater Gods are back (if they ever really left).

Dan Hawkes N7TVP, Tucson AZ The current controversy over code requirements is creating an unnecessary rift between ham radio operators. The sooner this dilemma is resolved the better it will be for everybody. To this end, I would like to propose the following compromise:

A) Require a code test at five words per minute only and leave band privileges as they are.

B) Novice through General class applicants would retest for code at the five word level each time they renew their licenses.

C) Advanced and Extra class operators would not need to retest for code but would, instead, be required to answer an increased number of questions on their tests.

With the advances that have been made in amateur radio technology, emergencies (such as the recent disasters in California, Florida and Hawaii) are handled in the phone mode rather than with code transmissions. Also, it is not necessary to be able to transmit code at a faster rate in order to communicate with hams in other countries. This is not to say that skill in Morse code transceiving is not a good thing to have. It is, but five words per minute is sufficient for all applications.

I would like to see an end to the battles over code requirements. I feel that this compromise is a fair one which, if adopted, could finish the fighting and allow us all to move forward together.

Dan—The battle is over. It ended two years ago with the enactment of the new Technician class. Anyone who is still battling this issue is living in a dream world. *David N1GPH*

Larry Larson KI5KE, Austin TX I recently sent my two Alinco 560s to be repaired. Both radios had a frequency drift in excess of 5k. They were in rugged shape as they were both used on a daily basis. I sent a nominal repair fee as both were under warranty. Two weeks later the radios arrived.

I thought they had sent two new radios until I checked the serial numbers. Alinco had replaced both covers and keypads and returned them. They also sent a new battery case. They returned the radios packaged separately with an explanation of the work and sent them second-day air.

It's not often a company goes out of its way for a customer and I want others to know about this case. Customer service is worth more than glitzy advertising.

Dennis J. Spranger K9AEG, Eland WI Just a few words about the MFJ-1278, MFJ-1290AM and the Amiga computer system. One word says it all: WOW!

What a combination. The low price of an Amiga system with its multitasking abilities, teamed up with the MFJ multimode, is a marriage bound to happen. Dan Schein did a great job of programming the 1290AM. Please let him know this. The software works flawlessly, even in Version 1.0.

Next month I will upgrade my Amiga 3000 system, sporting the new 2.0 operating system. It's a refreshing change to come home to a powerhouse system such as the Amiga and the MFJ. Those who haven't tried this combo may not know what they are missing. As I am typing this letter, my $500 computer system is downloading WEFAX on 10.830 MHz. Try that with a $500 IBM or compatible!

ROSE, Mundelein IL Although I am not yet a ham, I do live with one. My husband has been a ham for about 15 years. He obtained his Novice license at that time. Raising a family and working every day didn't leave much time for radio, but having the license did enable him to obtain a job in the computer field. We are convinced that he would have had a much more difficult time being hired at his age, 45, if he had not had his license.

Although his more advanced licenses got put on hold, eventually there came the day when illness forced him to retire on disability. There was suddenly a lot of time to fill and amateur radio fitted the bill perfectly. It was something he could do without a great deal of strain or stress, and it made the days fulfilling.

However, as he advanced, he also became frustrated with not being able to communicate with his contacts in a more meaningful manner. So, he started to write down phrases and words in other languages. Going to the library and looking this up gave him more interest in his hobby.

Eventually, this hobby started to take on a life of its own. As his notes began piling up, it only made sense to put them in some sort of order. So, I came up with the idea of putting them in book form.

Maybe this will never be a gigantic business, but the hams who are buying and using my books are very enthusiastic.

So, this is my small business, spawned directly from amateur radio. So far, there are three books available and I am currently working on the fourth. I intend to put out at least five. They are called *Speak to the World*. Each book has five different languages, each language laid out exactly the same for easy use. RF

MFJ's world famous
Ham Radio Accessories

Why do more hams throughout the world use MFJ accessories than any other brand? Because they are value packed and carry MFJ's one year unconditional guarantee!

MFJ Speaker Mics

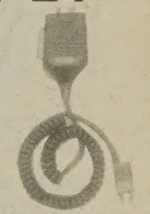
Compact or miniature models for all popular HTs

Compact Speaker Mics, $24.95 each: MFJ-284 or MFJ-286 **$24.95**

Once you try an MFJ Speaker Mic you'll never want to be without it. You'll be able to carry your handheld on your belt and never have to remove it to monitor calls or talk.

You'll never have to turn up your audio annoyingly loud to monitor calls because it's handy lapel/pocket clip lets you keep it close to your ear for easy listening.

And you'll never have to clumsily remove your handheld from your belt holder to talk because you can conveniently take the speaker mic in one hand, press the push to talk button and talk. Measure 1¼" x 2" x 3"

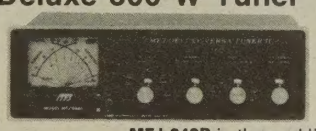


They come with a lightweight retractable cord that eliminates the dangling cord problem. They feature excellent audio on both transmit and receive. **MFJ-284 for Icom or Yaesu; MFJ-286 for Kenwood.** MFJ-283, MFJ-285, MFJ-285L, MFJ-287 or MFJ-287L **$24.95**

Miniature Speaker Mics, $24.95 each:

New miniature speaker mics pack all the features of the compact models into a tiny 2" x 1¼" x ¼" package. The lapel pocket clip swivels for even more convenient positioning. Also features transmit LED. Choose from regular or "L" shaped connector. Order **MFJ-285 or MFJ-285L for Icom or Yaesu, MFJ-287 or MFJ-287L for Kenwood. MFJ-283 for dual plug Alinco.**

Deluxe 300 W Tuner



MFJ-949D **$149.95**

MFJ-949D is the world's most popular 300 watt PEP tuner. It covers 1.8-30 MHz, gives you a new peak and average reading Cross-Needle SWR/Wattmeter, built-in dummy load, 6 position antenna switch and 4:1 balun -- in a compact 10 x 3 x 7 inch cabinet. Meter lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

12/24 Hour LCD Clocks

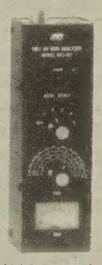
$19.95 MFJ-108B **$9.95** MFJ-107B

Huge 5/8 inch bold LCD digits let you see the time from anywhere in your shack. Choose from the dual clock that has separate UTC/local time display or the single 24 hour ham clock.

Mounted in a brushed aluminum frame. Easy to set. The world's most popular ham clocks for accurate logs. MFJ-108B 4½x1x2;MFJ-107B 2¼x1x2 in.

SWR Analyzer

MFJ-207 **$99.95**

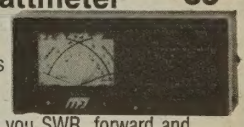


MFJ's innovative new SWR Analyzer gives you a complete picture of your antenna SWR over an entire band -- without a transmitter, SWR meter or any other equipment.!

Simply plug your antenna into the coax connector, set your SWR Analyzer to the frequency you want and read your SWR. You can instantly find your antenna's true resonant frequency,something a noise bridge can't do. Covers 1.8-30 MHz (or choose **MFJ-208, $89.95** for 2 Meters). Use 9 V battery or 110 VAC with MFJ-1312, $12.95.

MFJ Cross-Needle SWR/Wattmeter

MFJ-815B **$69.95**



MFJ Cross-Needle SWR/Wattmeter has a new **peak** reading function! It shows you SWR, forward and reflected power in 2000/500 and 200/50 watt ranges. Covers 1.8-30 MHz.

Mechanical zero adjusts for movement. SO-239 connectors. Lamp uses 12 VDC or 110 VAC with MFJ-1312, $12.95.

VHF SWR/Wattmeter

MFJ-812B **$29.95**

Covers 2 Meters and 220 MHz. 30 or 300 Watt scales. Also reads relative field strength 1-170 MHz and SWR above 14 MHz. 4½x2¼x3 in.

Deluxe Code Practice Oscillator

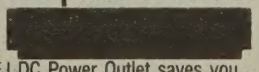
MFJ-557 **$24.95**

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base so it stays put on your table. Portable because it runs on a 9-volt battery (not included) or an AC adapter ($12.95) that plugs into a jack on the side.

Tone and Volume controls for a wide range of sound. Speaker, earphone jack. Key has adjustable contacts and can be hooked to transmitter. 8½x2¼x3¾ in.

MFJ Multiple DC Outlet

MFJ-1112 **$29.95**



New MFJ DC Power Outlet saves you space **and** money. Hook it to your 12 VDC power supply and get 6 DC outlets for connecting your accessories. RF bypassing keeps RF out of power supply from DC line outlet. 13½x2¾x2½ in.

Nearest Dealer/Orders: 800-647-1800

MFJ ENTERPRISES, INC.
Box 494, Miss. State, MS 39762
(601) 323-5869; **FAX:** (601) 323-6551
TELEX: 53 4590 MFJ STKV

• One year **unconditional** guarantee • 30 day **money back** guarantee (less s/h) on orders from MFJ • Add $5.00 each s/h • **FREE** catalog

MFJ . . . making quality affordable

CIRCLE 86 ON READER SERVICE CARD

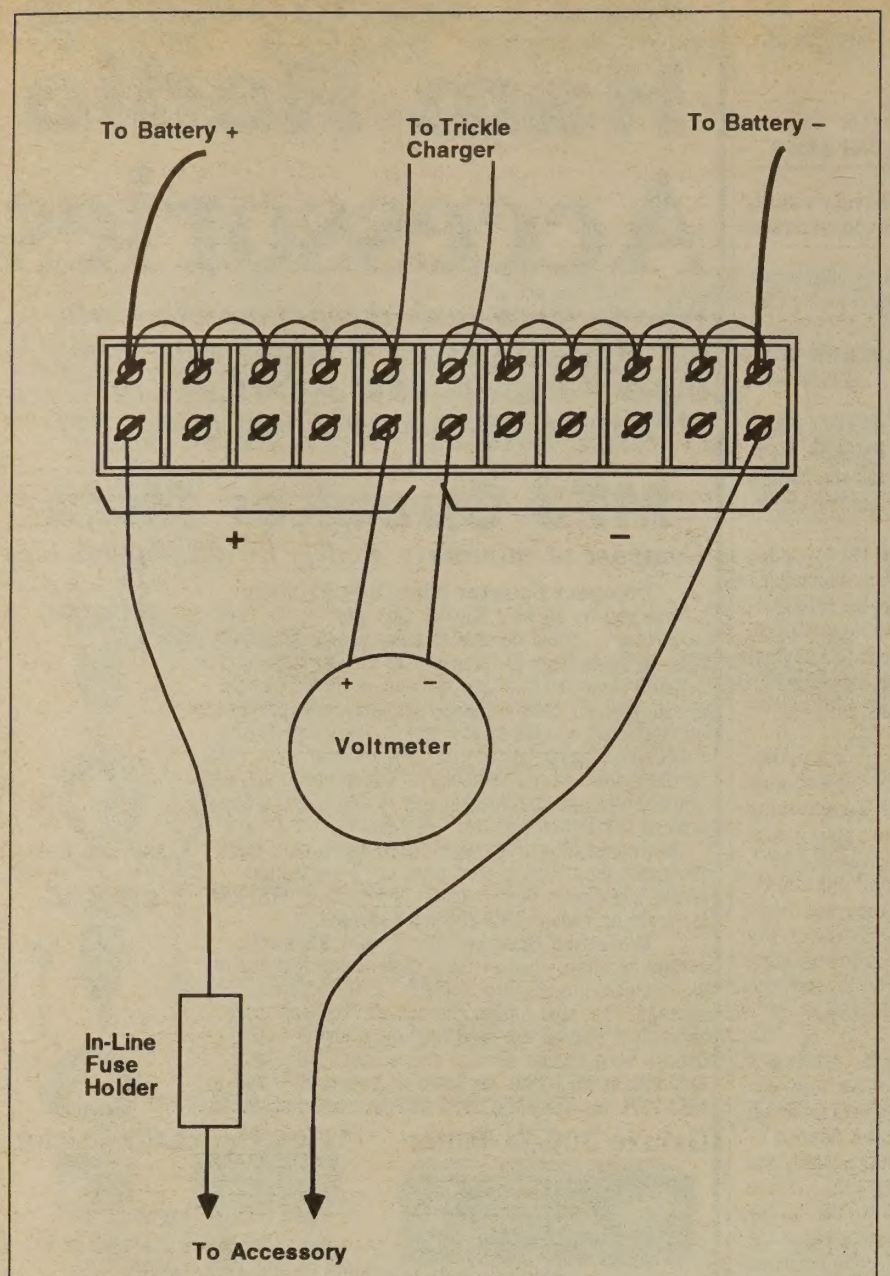


Figure 3. Distribution wiring diagram for the shack.

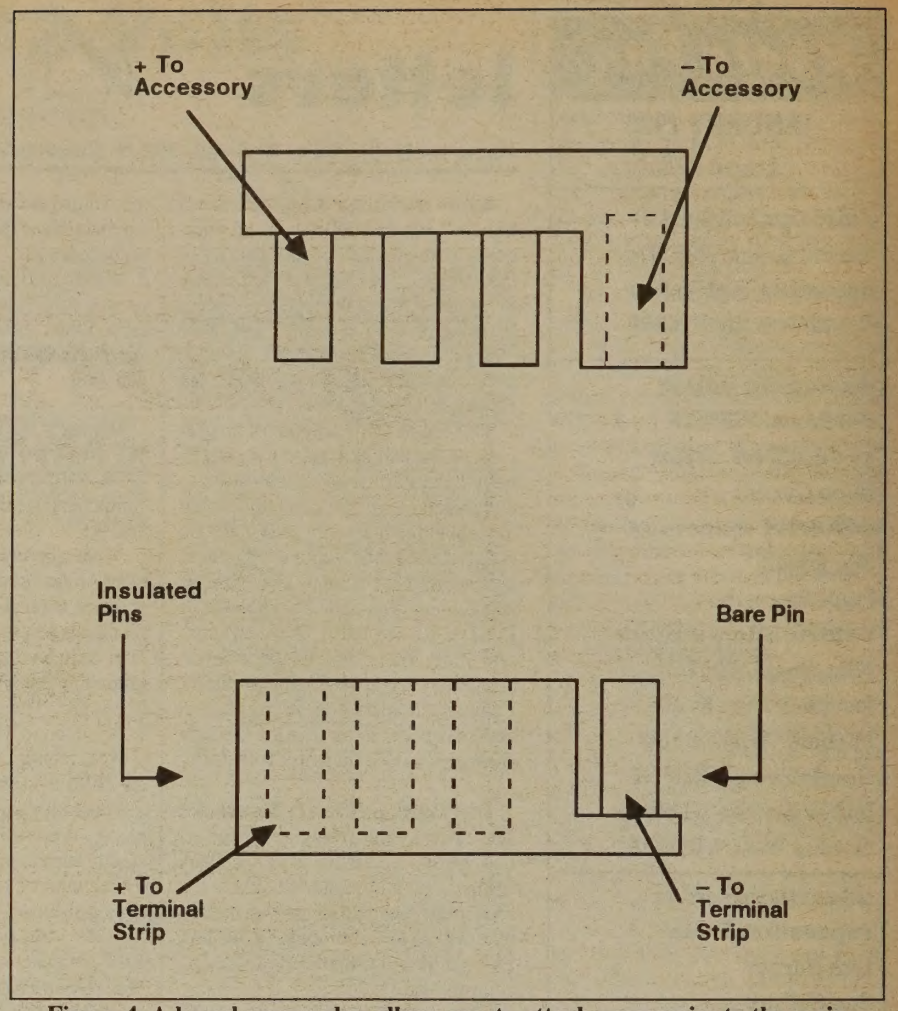


Figure 4. A keyed power plug allows you to attach accessories to the main power strip while protecting against reverse voltage hookups.

Wire Your Shack Continued from page 4

One good source of 12-volt connectors is the auto trailer accessory department in a local store. There is a standard four-pin in-line connector which is available as a set—male and female—for under $3. Radio Shack also carries them under the number 270-027. Use the female connector (the one with the three covered sockets) as the source of 12 volts, and the male (with the three exposed pins as the connector) wired to the rig or accessory. You only have to use two pins, and a suggested wiring for the pins is shown in Figure 4.

No More Transistor Batteries

Many of the little accessories found today require 9-volt or "transistor" batteries. Some of them actually will function very well on 12 volts; however, rather than take a chance, use the little circuit shown in Figure 5—it will supply 9 volts from the main 12-volt supply. All of the parts are available at Radio Shack. The diode shown is a "zener diode," or regulator diode, rated at a nominal 9.1 volts. Don't let the extra 0.1 volt rating bother you.

Figure 6 shows a pictorial of the wiring of the circuit. You can use any little preetched printed circuit board, such as the Radio Shack 276-159. In fact, you don't even need to use a chassis—you can haywire it in mid-air. Perhaps this isn't neat, but it is practical!

The circuit will supply up to 100 milliamperes at 9 volts from the 12-volt supply. This is far above the requirements of most small 9-volt accessories. If your device needs more than 100 milliamperes it probably burns out batteries in an hour or two.

The output connector is a standard transistor battery connector wired in reverse. This will mate exactly with the accessory power plug which previously plugged into the 9-volt battery. Be very careful and wire the connector as shown in Figure 6.

After wiring the device, connect a 100-ohm resistor across the output. With this resistor in place measure the output voltage. If it reads around 9 volts (plus or minus a half volt is OK) the circuit works correctly. If it reads 12 volts, 0 volts, or some odd value, go back and check your wiring.

As a final step in the checkout of the circuit, place a 9-volt battery next to the power connector and with a voltmeter make sure that the circuit output connector gives you the same polarity as the connector on the battery. It's better to be safe than sorry.

Safety

As with any home project, you have to be a little careful. Keeping the battery in a ventilated area is one obvious need. Using wires selected to have a low voltage drop, as discussed before, is another requirement. If you use wires that are too small your rig could still work, but there is a possibility that the drop in the wire will produce excessive heat and a fire danger.

Finally, the battery chargers on the market are not always the best available, so mount yours in a position where, if it shorts or sparks, there is nothing near it which can be easily set on fire. Remember that you are going to have it on every night, unattended, for a few hours. If it does not come with a fuse for the AC line it might be a good idea to add one. Alternately, you can plug it into a power strip which is equipped with a circuit breaker, such as the Radio Shack part #61-2620.

One evening of building, with a few simple precautions, and you will have a convenient source of power for all of your low voltage accessories and rigs. RF

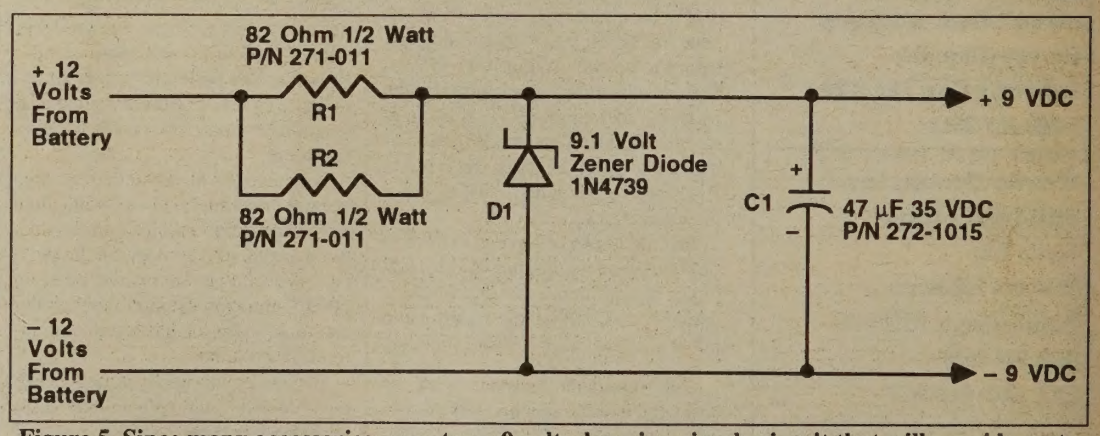


Figure 5. Since many accessories operate on 9 volts, here is a simple circuit that will provide up to 100 milliamps of current drain at 9 volts from the 12-volt main supply.

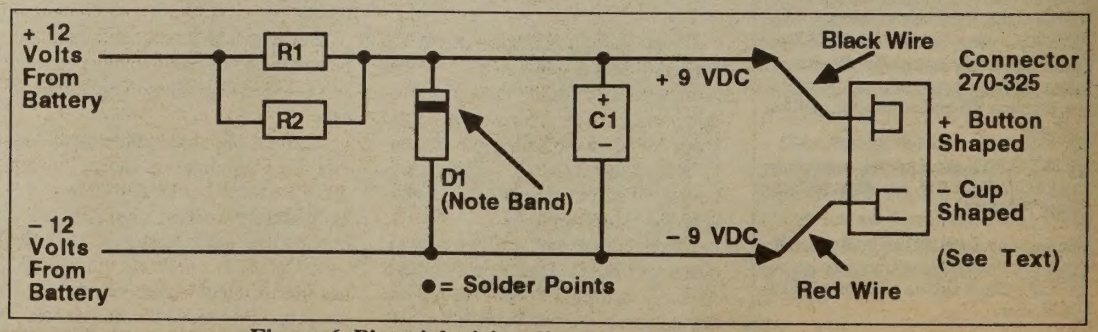


Figure 6. Pictorial wiring diagram of the 9-volt supply.

New Ham-Radio-Related Show

A new ham-radio-oriented radio show premiered on October 6, 1992, over shortwave broadcasting powerhouse WWCR on 7435 kHz.

WWCR is "Worldwide Christian Radio," and probably has the most eclectic programming of any broadcast station on the air! While most of its programming consists of radio evangelism, the station airs two populist-oriented political talk shows on weeknights, as well as the SWL-oriented "World of Radio" and ham-oriented "Signals" on Saturday night, and "Radio New York International" (a broadcast with a pirate-radio flavor) on Sunday evening.

The new half-hour show is called "Radio Techniques," and will air every Sunday at 2300 UTC (6 p.m. EST) on 15.690 MHz, with a repeat on Tuesday at 0700 UTC (2 a.m. EST) on 7.435 MHz. Host Howard Weinstein K3HW and co-host Bill Quinn KA2VUE invite suggestions for future program content. Send any correspondence to: "Radio Techniques," 15 Lakeside Drive, Marlton NJ 08053-2704, USA.

As explained by the host, however, "Radio Techniques" already has an ambitious syllabus, primarily for the prospective ham. The show will discuss such topics as electrical and radio fundamentals, how to become a ham (supplemented by a planned correspondence course), how to assemble and operate an amateur station, simple wire antennas, weekly HF propagation reports, and home-brew projects that listeners can build with Radio-Shack-type parts (instructions are available from the "Radio Techniques" address—the initial project discussed was an 80/40 meter QRP transmitter). *TNX W5YI Report, Vol. 14, Issue 20, October 15, 1992 and Vol. 14, Issue 22, November 15, 1992.*

Spread Spectrum Satellite

A spread spectrum amateur satellite will be launched and paid for by the U.S. Navy! Randy Roberts KC6YJY (El Granada, CA) tells about the Navy's PANSAT experiment in the September 1992 issue of *Spread Spectrum Scene*. *SSS* is a newsletter devoted entirely to spread spectrum engineering.

PANSAT, the acronym for "Petite Amateur Navy Satellite," is a store-and-forward messaging system that uplinks packet messages and then re-transmits them when the low-Earth orbit (LEO) satellite is in view of the destination station. The difference is that the emission is spread spectrum with direct sequence modulation.

The objective of PANSAT is to demonstrate the feasibility of a simple low-cost communications satellite featuring (1) Digital over-the-horizon communications; (2) Orbital mailbox concept; (3) Low probability of intercept; and (4) Low probability of jamming.

The performance of spread spectrum packet radio will be evaluated by using the amateur community as the user base. The actual satellite will weigh 150 pounds and will be about 19 inches in diameter. Launch is scheduled for late 1995.

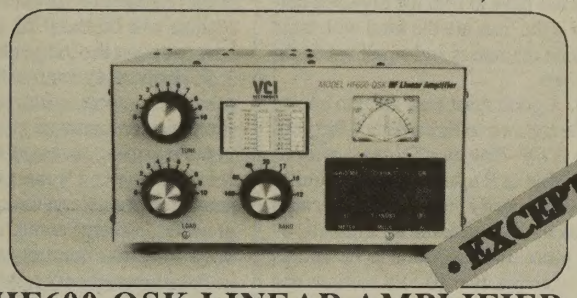
It will operate near 437.25 MHz with 1 MHz bandwidth, 1200 bps, AX.25 protocol.(97.207 authorizes amateur space stations to operate in the 70-cm ham band between 435-438 MHz).

The experiment is being conducted by the Naval Postgraduate School (NPS) in Monterey, California. NPS was created to keep the Navy abreast of critical new technologies. "Its programs are available to officers from all U.S. services and friendly nations to prepare them for technical leadership roles in the 21st century." NPS students will design, fabricate, test and operate the LEO digital communications satellite.

Sample copies of *Spread Spectrum Scene* are available for an SASE with $.52 postage;the price for 12 issues is $29.95. Telephone: (415) 726-6849. *TNX W5YI Report, Vol. 14, Issue 20, October 15, 1992.*

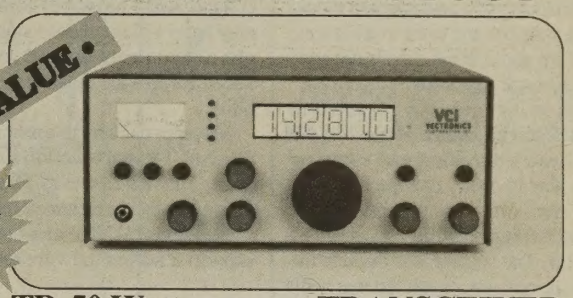
QUALITY, FACTORY DIRECT

BUY VALUE PRICED, INNOVATIVE HIGH TECHNOLOGY



VCI • EXCEPTIONAL VALUE •

NEW



HF600-QSK LINEAR AMPLIFIER
Tabletop Amplifier with WARC bands & optional QSK, 850 W most bands, 1,250 W PEP output. Price .... $~~1,399~~, NOW $1,350 delivered in U.S.

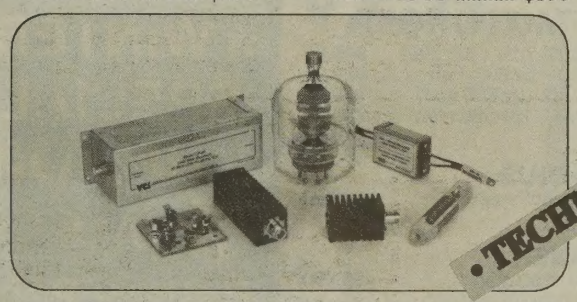
TR-50 Watt compact TRANSCEIVER
CW/SSB, compact, 3 Band, 8 pole filter. AC/DC input voltage. 50 Watts CW/SSB. Price ..(pick any 3 bands, 1.8-30 MHz).... $699

VCI • 18 MONTH WARRANTY •

NEW

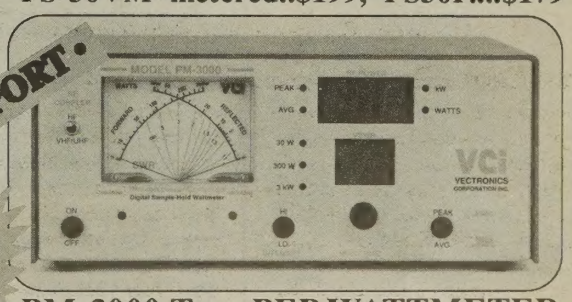
VECTOR 500 AMP, HFT-1500 TUNER
A great combination, 4 x 811A Linear with a 1.5 kW Antenna Tuner & new heavy duty Roller Inductor. Vector 500 ..... $899 HFT-1500 ..... $399

SWITCHING POWER SUPPLY
Compact, 30 Amps. PS400.....$225
LINEAR SUPPLIES, 21 A. cont. 30 max
PS-30VM metered..$199, PS30F....$179



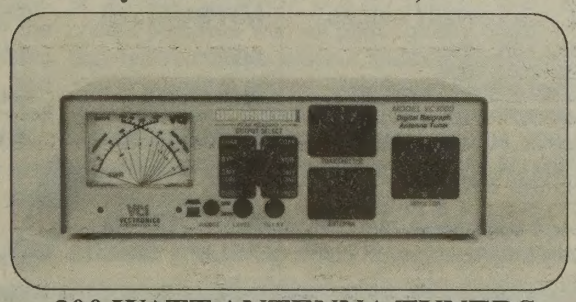
VCI • TECHNICAL SUPPORT •

NEW



FILTERS AND DUMMY LOADS
A wide range of HP, LP Filters & Dummy Loads from 40 to 2,500W.

PM-3000 True PEP WATTMETER
Microprocessor based Analog & Digital displays with variable hold times. Price: ..... $399.



300 WATT ANTENNA TUNERS
VC-300 Basic Tuner ,..$~~129~~..NOW.....$119
VC-300DLP With D.L. $~~149~~, NOW $139
VC-300D With Dummy Load & Digital Bargraph..... $~~185~~,.NOW.....$175

Vectronics Corp. Inc.

31 Estate Drive, Scarborough, Ont. Canada M1H 2Z2
Phone: (416) 289-4637 FAX: (416) 289-4638

ORDER FACTORY DIRECT
SHIPPING IS FREE IN USA

VISA

Call us Toll Free: 1 (800) 267-5354

ASK FOR FREE CATALOG

CIRCLE 70 ON READER SERVICE CARD

Movable Antenna Supports

by Bob Benson W2HZF

Have you ever gazed out into the back yard and wished that you had a tree or pole over there . . . and another over there—properly spaced, of course—for that new antenna you would like to put up? Well, there is a way to provide movable poles to support horizontal wire antennas and mount vertical antennas and even small beams. What I am about to describe is not new, but it is worth repeating.

Back in the mid-'60s I wanted to experiment with phased verticals. I did some head scratching and came up with a way to easily change the spacing of the vertical antennas without digging holes or having a yard full of guy lines. The answer was there in the garage, leaning up against the rear wall: two worn-out automobile tires that had somehow survived my wife's insistence that everything not in use be thrown away.

What I needed was a round, heavy antenna base that I could roll and position anywhere in the back yard. Round they were, but heavy they were not. But, if the tires could be filled with rocks and cement holding a short mast base section, they should do the job.

To serve as an antenna base, the old tires should preferably be from a large automobile. They will be filled with cement and rock to form a heavy base, so large tires are good up to a point. However, you do have to be able to roll them around the yard. On the other hand, small tires from compact cars may have a diameter too small to permit enough cement and rock to be added to provide sufficient base stability.

My approach is to embed a short piece of TV mast section in the concrete. This will serve as a support for either a vertical antenna or up to about 30 feet of 1-1/4" TV mast sections to support a horizontal wire antenna.

Constructing the Base

Here's how to construct this particular type of base.

1. When you have selected a suitable tire, measure the rim or inside diameter. Cut a square piece of 1/2" plywood with side dimensions about one inch shorter than the inside rim diameter of the tire. Draw a line connecting opposite corners to locate the center of the square.

2. Lay the tire on a horizontal flat surface and test fit the plywood square inside the tire so it rests centered on the bottom rim. If you cannot get the plywood square inside the tire, cut a little off the corners and try again. You may not have to trim the plywood corners if the tires are the kind with large outside diameters and small inside diameters.

3. A good mast base section choice is the top two to three feet of the popular 1-1/4"-diameter TV mast sections available at Radio Shack and similar stores. I specify "top section" because it has a reduced diameter end, allowing more mast sections to be added. For example, two 10-foot sections and one 5-foot section could be added to make a mast about 28 feet high. This could support one end of a horizontal wire antenna.

4. You now want to determine the desired length of the short mast section to be mounted to the plywood before pouring the cement. With the plywood resting inside the horizontal tire, measure the distance from the surface of the plywood to the top of the opposite rim. This measurement will depend on tire size and shape, but about five inches is typical. Add to this dimension a distance sufficient to accommodate the mounting bracket and "U" bolts of the typical multiband vertical. Also, allow for some "mounding" of cement around the base section to increase support. Don't forget to allow space to connect the coaxial cable to the base of the antenna. Also, make the section long enough so that both "U" bolts tighten on the full-diameter part of the section, avoiding the reduced diameter part at the top. The type of vertical antenna mountings I have in mind are those used on the BTV style of vertical. The total required length of the base mast section will be about 30 inches. It is best to err on the long side.

5. Temporarily remove the plywood square to prepare it for mounting the short piece of antenna mast.

6. Assuming that you've used the 1-1/4"-diameter TV mast section suggested, drill a hole in the center of the plywood just large enough to clear the 1-1/4"-diameter mast section. The hole in the plywood serves to center the mast section and provide rain drainage from inside the mast if it is not capped at the top.

7. Cut the appropriate length of mast section to be embedded from a 10-foot mast. Fasten a hose clamp about one inch up from the bottom end of the short section to prevent the section from sliding through the hole. Tape the ends of three or four cords, each cut to about 10 feet long, to one end of the leftover long piece. These will serve as temporary guys to keep the mast sections vertical while the cement is setting. Now place the tire on level ground, reinsert the plywood square in the tire, and couple the two mast sections and mount them in place. The temporary guys may now be set with tent stakes, bricks or whatever is handy.

8. Check with a level to be sure the sections are vertical and adjust the guys if necessary. Gather up some rocks, scrap metal and whatever else is heavy and handy; mix some cement; and you're ready to load the tire. At the edge of the plywood there will be four holes about half an inch wide that you may want to cover with plastic or newspaper before loading and pouring.

9. After pouring and inserting rocks, recheck with the level to make sure the mast section is still vertical. Once the cement sets, the tire, which is now an antenna base, can be moved about. The leftover length of mast serves as a lever arm to tip the tire to the vertical position so that it can be rolled to the location of your choice.

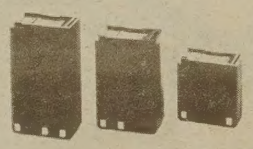
I found several uses for these bases. Let's look at a few possibilities.

Single or Multiband Verticals

A single base will support a single or multiband vertical antenna such as the 4BTV, 14AVQ and others. I have mounted a 14AVQ without guys, although I admit to tipping it by hand and laying it on its side when severe winds were predicted. Also, I mount-

BATTERIES
REPLACEMENT BATTERIES
(ALL NEW—MADE IN USA)

ICOM
7S 13.2v 1200 mah $54.00
8S 9.6v 1200 mah $52.00
BP7 13.2v 600 mah $59.00
BP8 8.4v 1200 mah $59.00
SA/SAT
BP82, BP83
BP83A 7.2v 750 mah
BP84 7.2v 1000 mah 3" $40.00
BP85A 9.6v 600 mah 3" $69.00
BP85B 12v 600 mah 3" $69.00

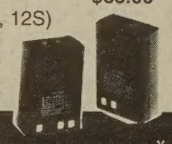
KENWOOD

PB1 12v 1000 mah $59.00
KNB4 7.2v 2200 mah $59.00
PB6 7.2v 750 mah $46.00
PB7 7.2v 1500 mah $55.00
PB8 12v 800 mah $49.00

MOTOROLA
HT300 7.2v 1600 mah $45.00
HT90 12v 600 mah $34.00
HT440 12v 600 mah $39.00
MT500 15v 500 mah $39.00
RADIUS
P-10 500 mah $28.00
SABER
7.2v 1100 mah $59.00

WINTER SPECIALS
10% Off
ALL
Battery Packs

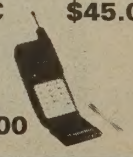
NEW
ALINCO
16N 7.2V 750 mah $35.00
18N 12V 600 mah $45.00
YAESU
FNB 25 7.2V 600 mah
FNB 26 7.2V 1000 mah
FNB 26A 9.6V 800 mah
FNB 27 12V 600 mah
FNB 27S 12V 800 mah

YAESU

FNB-2 v 500 mah
FNB-2 v 600 mah
FNB-4A 12V 1000mah $55.00
FNB-17 7.2V 600mah $30.00
FNB-10S 7.2v 1000 mah $42.00
FNB-12S 12v 600 mah $45.00
290 charger $65.00
(For FNB 17,10S, 12S)


Now Available:
ALINCO 580
EBP-20N 7.2V 800 mah
EBP-20NX 7.2V 1200 mah
EBP-22N 12V 800 mah
EDC-34 RAPID CHARGER $81.00

INSERTS
CALL FOR LOWEST PRICES
ALINCO 10N, 12N
AZDEN 3000, 4000
ICOM BP-2, 3, 5, 7, 8, 7S, 8S
KENWOOD PB-21, 21H, 25, 26
REGENCY MT1000, HX1200
SANTEC 142, 144
STANDARD BP-1
TEMPO S-1, 2, 4, 5, BP-15, S-15
TEN TEC 2991, 2591
UNIDEN (BEARCAT)

CELLULAR
MITSUBISHI $50.00
NEC $45.00
NOVATEL $45.00
PANASONIC $45.00
Bag Phone Kits
MOTOROLA "FLIP" $60.00


CAMCORDER
JVC
PANASONIC
PVBP80/88 12v 2.3 amps* $36.00
RCA/HITACHI
Full size
VHS-C
SONY
NP22
NP55/77 2400 mah $39.00
ALL BRANDS AVAILABLE
*original Panasonic

*ALL BATTERY PACKS—GUARANTEED TO HAVE THE ADVERTISED CAPACITY
SEND FOR FREE CATALOG
DEALER INQUIRIES WELCOME
BATTERY-TECH, INC.
28-25 215 PLACE, BAYSIDE, N.Y. 11360 FAX 718-461-1978
800-442-4275 — N.Y.S. 718-631-4275
VISA MASTER CARD DISCOVER
CIRCLE 105 ON READER SERVICE CARD

ed two 14AVQ verticals, each on its own base, with coax cable lengths and antenna spacing optimized for a cardiod pattern on 40 meters. This allowed rejection of an annoying broadcast station during the evening hours on the 40 meter band. For a ground plane, I laid chicken wire to form a cross under each antenna and positioned the antenna at the center of the cross. Four strips of heavy copper braid connected "ground," at the base of the antenna, to the chicken wire.

Horizontal Antennas

A single antenna base with two 10-foot and one 5-foot TV mast sections assembled to the base can support one end of a horizontal antenna anchored at the other end by your house peak. This would be fine for an end-fed antenna. But, most hams prefer center-fed horizontal antennas and prefer to have both ends of the antenna anchored away from the house. This generally allows the transmission line to run away from the antenna at right angles toward the shack, thus minimizing the chance for unbalanced line currents. Two such bases could be used to support a horizontal antenna located away from the house. They can be positioned just the way you want them for the best compromise between directivity and transmission line position. In this case, two light guys spaced 120 degrees on the far side of each mast are helpful to reduce the bending due to the load from antenna wire tension. Halyards and pulleys to raise and lower the horizontal antenna are optional. The mast can be "walked," or pried, to fine-tune the position and provide the proper wire tension. Also, it can be tipped over and grounded to make changes or provide a low lightning or wind profile in stormy weather.

Another advantage with this antenna support system is that antenna raising becomes a one-man job. Even if you wish to provide guys on the mast or vertical antenna for added safety, the antenna will remain stable while you are staking out the guys.

Two of these bases served for several years to support various horizontal and vertical antennas. They would probably still be in use today if I hadn't decided to move to another house. They were just too heavy to ship.

A similar base could be constructed without the use of a tire. How about using a strip of aluminum garden edging bent into a circle to serve as a frame to construct a rock-and-concrete wheel? This should work just as well as the concrete-and-rock-filled automobile tire.

The antenna base versions just described are fine for home installation, but are not well suited to portable operations such as Field Day—the base is just too heavy for transportation. A better portable approach is to make use of a wheel in addition to the tire and bolt a metal bracket arrangement to the wheel lug holes to support the base section. In this case the tire would require anchoring with local rocks, or the antenna or mast could be lightly guyed. RF

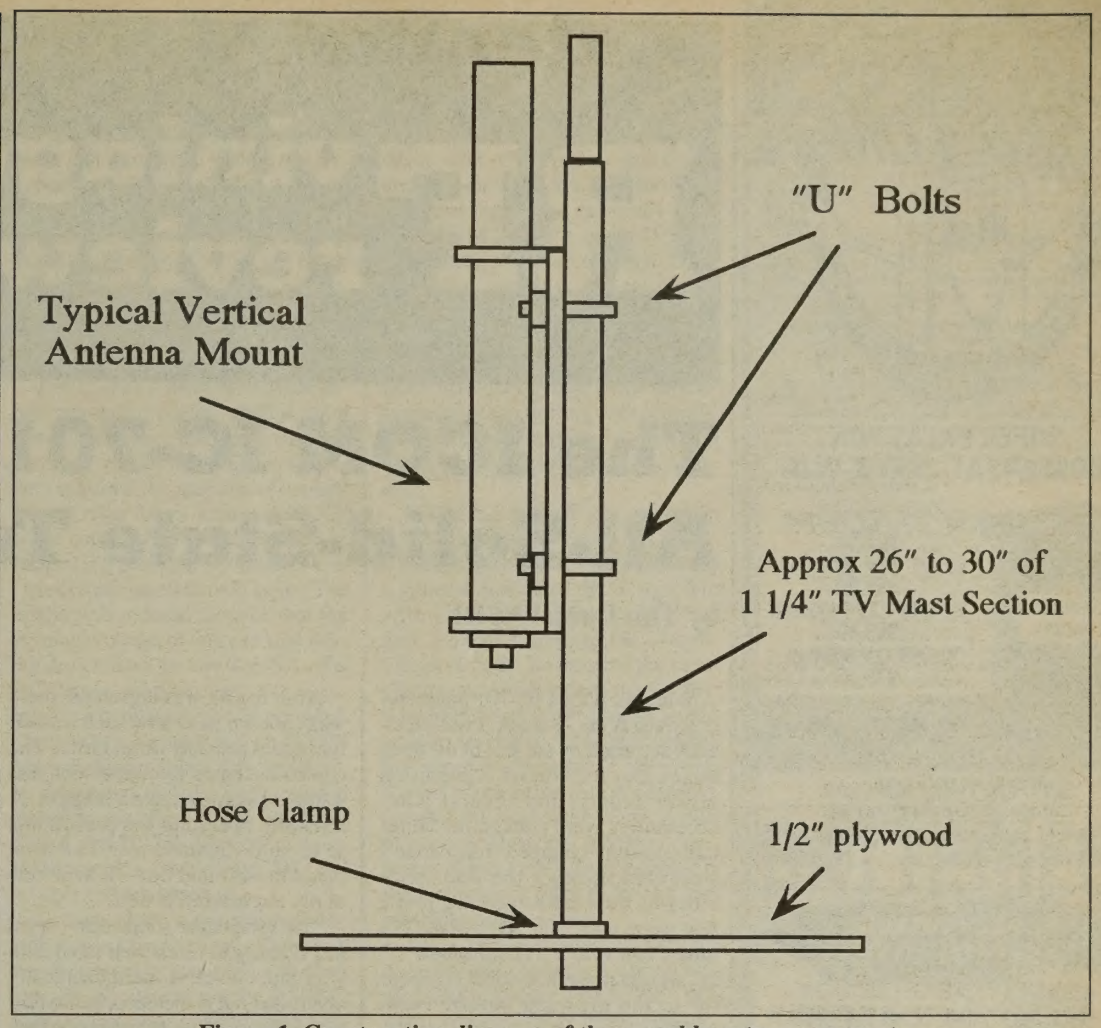


Figure 1. Construction diagram of the movable antenna support.

RAMSEY ELECTRONICS

PHONE ORDERS CALL
716-924-4560
FAX 716-924-4555

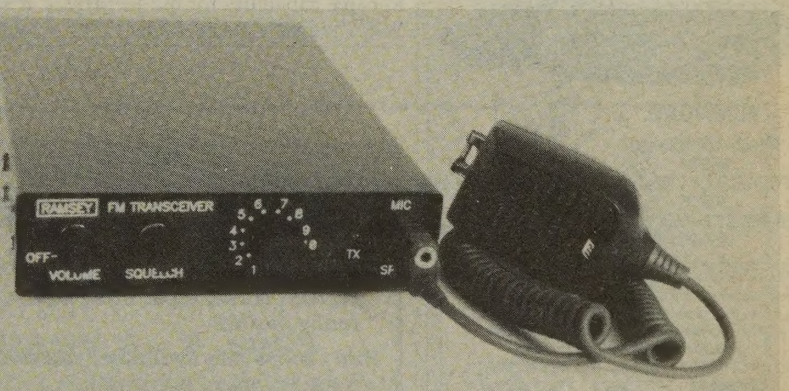
FANTASTIC FM TRANSCEIVER KITS!

2 meters • 223 MHz • 440 MHz

only $149.95!

$169.95 for 440 MHz

Fully Synthesized - No Crystals



Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable, mobile or a dedicated packet rig. Wide frequency coverage (20 MHz) and programmable repeater splits makes the FX the perfect rig for CAP, MARS or business band snooping. Packeteers really appreciate the built-in packet I/O connector, true FM signal, instant T/R switching and 9600 baud capability. You get twelve channels – easily diode programmed anywhere you want, 5 watts RF output (3-4 for FX-440), sensitive dual conversion receiver with crystal and 6 pole ceramic IF filters, plus proven easy assembly.

You build your FX in stages of a few parts at a time, logically working your way along through each section, testing your work as you build. The only test equipment you'll need is a voltmeter and another radio or frequency counter. Our 120 page instruction manual will carefully guide you to a finished unit that will work first time – and you'll learn, too! Why pay more for a used foreign-made rig when you can have an AMERICAN MADE one (by you) for less? Kit comes complete with all parts, quality epoxy PC board with printed parts layout, and extensive manual. You only need to add an ICOM/Radio Shack/Yaesu style mike and suitable enclosure. The Ramsey matching case set includes all hardware, knobs and rugged steel case (weighs 3 lbs!), with durable black powder coat finish.

Building your own rig, isn't that what ham radio is all about? Is ham radio simply buying a foreign rig we just unpack and plug-in? Let's stop sending our dollars overseas, start building, learning, experimenting and regain our technological edge.

FX-146 (2 meters)	**$149.95**	Still not sold? Order our FX manual and see for yourself! Only $10.00, refundable with purchase of transceiver kit.
FX-223 (1 1/4 meters)	**$149.95**	
FX-440 (70 cm)	**$169.95**	
CFX matching case set	**$ 24.95**	**FX manual, specify band desired - $10.00**

2 METER & 220 BOOSTER AMP

BOOST THE OUTPUT OF YOUR 2 METER OR 220 MHZ HT OR RAMSEY TRANSCEIVER FOR A LOT LESS THAN THOSE HIGH-PRICED AMPS!

These power boosters deliver over 30 watts of output, while a low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of these units. Get the features of those high-priced boosters at a fraction of the cost!

PA-10 2 meter, prewired (10x power gain) - $89.95

PA-20 220 MHz, prewired (8x power gain) - $89.95

YOUR SATISFACTION IS GUARANTEED. Examine your Ramsey product for 10 days. If you're not pleased, return in original condition for refund. Add $3.75 for shipping handling and insurance. Foreign orders add 20% for surface mail. COD (US only) add $5.00. Orders under $20.00 add $3.00. NY residents add 7% sales tax. Warranty: 90 days on kit parts; 1 year parts and labor on pre-wired units.

PHONE ORDERS CALL
716-924-4560 FAX 716-924-4555

MasterCard VISA

RAMSEY ELECTRONICS, INC • 793 Canning Parkway • Victor, NY • 14565

CIRCLE 34 ON READER SERVICE CARD

REMEMBER...A LOW COST POWER PACK WITHOUT PERIPHEX'S QUALITY IS NO BARGAIN

PERIPHEX POWER PACKS FOR LONGER QSO TIME

MADE FOR HAMS BY HAMS

SUPER PACKS FOR ICOM 2/4SAT, 24AT & W2A

EXTENDED CAPACITY

BP-83S 7.2V 750mah $43.50
BP-84 7.2V 1000mah $57.00
BP-84S 7.2V 1400mah $63.00
BP-85S 12V 800mah $76.00

BP-114S 12V 800mah $79.00

SAVE ON THESE POPULAR PERIPHEX POWER PACKS
BP-7S 13.2V 1200mah ... $65.00
BP-8S 9.6V 1200mah ... $65.00

CALL FOR OUR SPECIAL OFFERS

FNB-2 10.8V 500mah $22.50
FNB-12 12V 500mah $45.95
FNB-14S 7.2V 1400mah $59.75
FNB-26 7.2V 1000mah $60.00
FNB-27S 12V 800mah $65.00

GREAT YAESU VALUES!

NEW BATTERIES AVAILABLE. CALL!

KENWOOD
PB-8S 12V 800mah $59.00
PB-13S 7.2V 1200mah $49.75
PB-25/26S 8.4V 900mah $65.00

Manufactured in the U.S.A. with matched cells, these Super Packs feature short circuit and overcharge protection, and a 12 month warranty. All inserts and packs in stock or available from authorized dealers.
CALL US TO DISCUSS YOUR BATTERY REQUIREMENTS.

VISA DISCOVER MasterCard

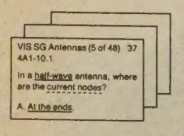
Add $4.00 S & H FOR FIRST BATTERY, $1.00 FOR EACH ADD'L BATTERY - U.S ONLY. Connecticut residents add 6% tax.

PERIPHEX inc.
115-1B Hurley Road, Oxford, CT 06478
800•634•8132
In Connecticut 203•264•3985 – FAX 203•262•6943

CIRCLE 68 ON READER SERVICE CARD

QUICK, EASY, & COMPACT

Flash cards * NOVICE thru EXTRA * theory Key words underlined. Over 4000 sets in use! For beginner, OMs, XYLs & kids.



NOVICE $11.95
TECHNICIAN $10.95
GENERAL $ 9.95
ADVANCED $15.95
EXTRA $14.45
Shipping 1—$ 3.00
2 or more —$ 4.00
CLUB DISCOUNTS

Order Today! from
VIS STUDY CARDS
P.O. BOX 16646
HATTIESBURG, MS 39404

CIRCLE 104 ON READER SERVICE CARD

Kits for the Beginner!
•Mini-Keyer: an iambic keyer designed around the Curtis 8044ABM chip. A real cutie!
•Tunable Bandpass Audio CW Filter: This simple filter kit really works!

Many more kits available, call or write for more information.

Tejas RF Technology
17 South Briar Hollow, Suite 101
Houston, Texas 77027
telephone 713-840-8600
fax 713-840-8608

CIRCLE 93 ON READER SERVICE CARD

FAST! ACCURATE! AFFORDABLE!

AN EXCITING new shortwave radio station database program. Sophisticated, menu driven, on-screen instructions. Contains 1000's of radio station records. Records can be changed, updated, or deleted. New records can be added as desired. Sorts by radio station, frequency, schedule, language, country and continent. Prints all sorting conditons; also prints specific language reports: English, Arabic, Chinese, French, German, Indonesian, Japanese, Russian and Spanish. IBM and compatible computers with harddrive. Just $19.95 Cont. U.S.- $25.00 outside Cont. U.S. Mention diskette size 3.5 or 5.25.

ORCHID CITY SOFTWARE
P.O. BOX 18402
West Palm Beach, FL 33416

CIRCLE 73 ON READER SERVICE CARD

SELL YOUR PRODUCT IN RADIO FUN
CALL DAN HARPER OR SUE COLBERT TODAY
800-274-7373

UNADILLA ANTENNA MANUFACTURING CO.
PO Box 4215 BV•Andover•MA•01810
(508) 474-8949 24 Hour FAX
(508) 475-7831 9-5 EST M-F

THE BIG™ SIGNAL
Amateur Antenna Baluns

W2AU (1:1 & 4:1)

For over 20 years, preferred by Amateur, Military and Commercial Operators. Assembled with all stainless steel hardware and a built-in lightning arrester minimizes your TVI, maximizes your power.

W2DU (HF&VHF)

Transformer Baluns
For medium power (1000 watts RF minimum) and broadband operation 3-40 MHz.

W2AU 1:1	W2AU 4:1
50/50 or 75/75Ω	200/50 or 300/75Ω
Dipoles,V's	Hi-Impedance Antennas
Beam Models, Quads	(ie:Folded Dipoles)

Non-Transformer Baluns

W2DU-HF		W2DU-VHF
1.8-30 MHz		30-300 MHz
3000-9000W	w/1:1 SWR	2000-4000W
1500-5000W	w/2:1 SWR	1200-2400W

Contact Your Local Ham Dealer Today!!!
To order direct call (508) 475-7831or write for our informational brochure on our other fine products
Baluns•Antenna Kits•Filters•Center Insulators•ENDsulators™•Coaxial Relays
All products come with a 30 Day Warranty

-NOTICE-
We are the NEW manufacturers of the original JAMES MILLEN™ Products
(508) 975-2711 9am-5pm EST M-F

CIRCLE 136 ON READER SERVICE CARD

RF vintage review

The ICOM IC-701 All-Band All-Solid-State Transceiver

by Tim Daniel N8RK

When an ICOM IC-701 transceiver arrived at the *73* shack, I was pleasantly surprised by the size of the three boxes that the rig, its companion power supply, and several other accessories were packed in. Times had certainly changed from when I stumbled through the door with a brand-new tube-type rig just a few years ago. The 701's size (111 mm x 221 mm x 311 mm) and 7.3 kg. weight make it an ideal competitor in the growing mobile radio market.

There is no tune-up to worry about, since the radio is broad-banded. You just set the band and frequency and start talking. It's almost as easy as operating a 2 meter rig. The 701 has full coverage of the HF spectrum in the USB, LSB, CW, and RTTY modes. Receive capability for the 15 MHz WWV signal is also included.

After the rig was unpacked, there was concern as to how such a small box could possibly do so much. The controls seemed to be crowded and it looked easy to make a mistake. A month of operating has proven this to be an ill-founded fear. The front panel is well laid out—ICOM certainly engineered it well.

The solid-state finals don't need any coaxing to reach their rated 200-watt input level. A thermostatically controlled fan is included, but in normal SSB use it has never had to kick in. This rig runs cool. It is important to use a well-matched antenna with your 701, a small price to pay in an age when many ham shacks have antenna tuners already. If the transmitter does overheat, the flashing frequency display lets you know that it's time to pull the switch and find out what's wrong.

Versatile VFOS

Anyone who operates *73*'s IC-701 mentions the synthesized tuning as an outstanding feature. The computer-compatible tuning system allows 110 Hz increments in frequency selection. Even the most discriminating amateur should be pleased with being no more than 50 Hz from the desired frequency. The musical effect that occurs when a heterodyne is tuned in always brings a smile to the face of a first-time user.

The tuning knob has a 5 kHz per revolution change, but a "fast tune" position allows the band to be covered in seconds. The only analog readout available is from the 100 Hz and 1 kHz dial markings. The idea of being totally dependent on a digital display doesn't seem so bad when you remember that dial backlash and the like are things of the past with the IC-701. No external VFO is needed since the rig contains two independent ones. It is handy to set VFO "A" on a particular receive channel and use VFO "B" for transmitting when working DX. Total flexibility is the best way to describe it.

This rig stands apart from the rest when an ICOM IC-RM2 is hooked to the accessory socket. It is a whole new world of operating when you can change bands and enter frequencies from a keypad. Push a button and you are on a completely different band and predetermined frequency; push another button and the 701 scans to the band edge, all in less time then it takes to say your callsign. The RM2 provides a second digital readout that is smaller than the 701's display, but it is still very useful. Four frequencies may be stored

The ICOM IC-701

in memory and three different scanning rates are available. Any number of schemes involving remote operation, crossband repeaters, etc., are possible, thanks to the computer-compatible tuning system.

Helpful Extras

No matter how versatile the ICOM IC-701 synthesizer is, the rest of the rig must also be considered. Despite the lack of any pre-select control, the receiver seems to offer a sensitivity that is comparable to tuned rigs. SSB reception lacks any tinny or echoing quality, and the external speaker does a more than adequate job. The passband and RIT features are very smooth and go a long way in eliminating troublesome QRM. The instruction manual honestly states that the noise blanker works best with pulse-type noise, but may not be effective in all cases. Mobile operators may not be interested in features like a 10 dB attenuator and selectable AGC, but ICOM includes them for amateurs who take their operating seriously.

Speech processors have become more than just an option with most new transceivers, and the 701 is no exception. ICOM advertisements suggest that the RF processor may be left on all the time without worrying about the final transistors. However, we found that the added punch given by the processor means slightly less fidelity for the operator on the other end. Processing is definitely used when I am in a pile-up or similarly tough situation. The proper adjustment of the speech processor and microphone gain can be a bit confusing at first, especially when you switch to CW and the process control knob sets the output level. Hams who split their time between SSB and CW will be pleased with the 701's separate VOX delay values for each mode. No compromise here—there is even a separate volume control for the sidetone.

The four VOX adjustments, plus seven other controls, are found under the access cover which is conveniently located on top of the radio. ICOM has included an SWR metering circuit. Unfortunately, it is easy to leave the "set" switch on, canceling the power-out (PO) metering. The SWR meter is nice for making occasional antenna checks, but it can't compete with the external variety. Another frill is the dimmer switch. This allows the frequency display and meter illumination to automatically change when the room lighting shifts.

A Few Bugs

The IC-701's most noticeable deficiency was revealed when it came time to interface the rig to the real world. Use with many linear amplifiers required the addition of a small 12-volt relay for switching and a 10k pot to control the ALC level. A more frustrating problem occurred when I tried to use an electronic keyer. The instruction manual dictates that the terminal voltage of any external keying device must be less than 0.4 volts DC. Since many keyers use electronic switching, they will not work here. When I contacted an ICOM representative about this problem, he suggested that the keyer output circuit be modified. It was also mentioned that ICOM does not consider this to be a fault of the 701, and no changes are planned.

To save space, a miniature phone jack is used for the key, rather than the universally accepted 1/4-inch type. If you want to use the IC-RM2 remote controller in addition to other accessories, it will be necessary for you to modify the 24-pin accessory plug or obtain the IC-EX1 extension terminal. The EX1 overcomes the switching relay problem and offers a 1/4"-jack-to-miniature-phone-plug combination for CW keying. Although the interfacing problems are not insurmountable, they can mean an unneeded delay for the amateur who expects easy hookup.

Since the IC-701 relies heavily on digitally-based circuitry, RF shielding is very important. Correspondence with other hams— and on-air testing—have shown that feedback problems may occur, especially when the IC-RM2 remote controller and high-power amplifier are used. Good grounding practices and careful attention to the audio lines help to cure these bugs. The instruction manual gives adequate information on problems that may result from misadjustment of the normal user controls, but little information is available about other difficulties that may crop up.

ICOM has incorporated more than 470 solid-state devices in the 701. The theory documentation provides a general outline of the design, but with a few exceptions, it does not give a detailed description of individual circuits. Because of the complexity and small size of the IC-701, it is doubtful that most hams would want to service it. Some instructions for internal adjustments are given. These often require a frequency counter, RF voltmeter, signal generator, or oscilloscope. A highly competent dealer or ICOM distributor is the best source of help for the less adventuresome owner.

Being limited to admiring the rig's outward appearance is not an unpleasant pastime. The IC-701 is a sharp looking, highly functional unit. Our 701, with accessories, has performed well during daily use for the past month. Although ICOM's compact "black box" seems dwarfed by the nearby antenna tuner, it is a real performer. RF

Reprinted from 73 Magazine for Radio Amateurs, *October 1979*.

Why buy a TNC?
PC HF FAX + PC SWL $179.00

SPECIAL COMBINATION OFFER

For a limited time, if you order PC HF FAX $99 (see our other ad in this issue), you can add our new and improved PC SWL 3.0 for $80.00 instead of our regular low price of $99.00.

PC SWL contains the hardware, software, instructions and frequency lists needed to allow you to receive a vast variety of digital broadcasts transmitted over shortwave radio. All you need is any IBM PC or compatible computer and an SSB shortwave receiver. The product consists of:

Demodulator
Digital Signal Processing Software
200 Page Tutorial Reference Manual
World wide Utility Frequency List
Tutorial Audio Cassette with Samples

PC SWL automatically decodes Morse code, RTTY, AMTOR, SITOR, NAVTEX and ASCII.

PC SWL lets you tune in on world press services meteorological broadcasts, ham radio operators, coastal shore stations, aviation telex and much more digital action on the shortwave bands. Why pay for another expensive box when a simple interface and your PC can do the job?

ADVANCED FEATURES:
Tuning Oscilloscope
Digital Waveform Presentations
Auto Calibration and Code Recognition
Continuously Tunable Filter Frequencies
Variable Shift
Adjustable CW Filter Sensitivity
Unattended Capture and Printing
Integrated Text Editor
Integrated Log and Database
Shell to DOS applications
Seamless Integration with PC HF Facsimile

Call or write for our complete catalog of products.
Visa & MasterCard welcome.

Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
Tel:(714)498-5784 Fax:(714)498-0568

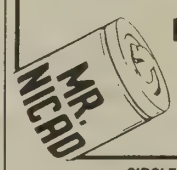
CIRCLE 244 ON READER SERVICE CARD

BATTERIES

Nickel-Cadmium, Alkaline, Lithium, Sealed Lead Acid For Radios, Computers, Etc. And All Portable Equipment

YOU NEED BATTERIES?
WE'VE GOT BATTERIES!

CALL US FOR FREE CATALOG



E.H.YOST & CO.
7344 TETIVA RD.
SAUK CITY, WI 53583
(608) 643-3194
FAX 608-643-4439

CIRCLE 114 ON READER SERVICE CARD

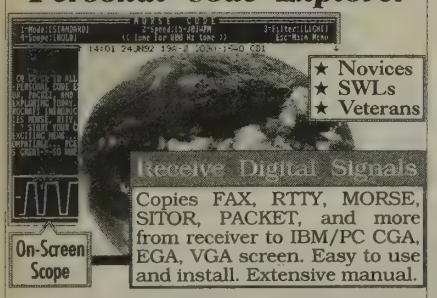
HANDIE-BASE
(PATENT MAILED)

For Your Handheld Radio or Handheld Scanner. Features Include: Solid Walnut Base, Powder Coated Steel Frame, Non-slip Rubber Feet, 5 year Warranty. Models Available for Most Radios or Scanners. Works on Desktops, Tabletops, Work Benches, or any Flat Surface. Add An Extension Speaker/Mic, Power Supply & External Antenna and It Converts Your Handheld Radio into A Base Station. To order send $14.95 plus $3.50 shipping to:

Handie-Base & More Inc.
P.O. Box 2504, Dept. D-2
Broken Arrow, OK 74013-2504
(Please Specify the Size of Your Handheld Radio - Small or Regular)

CIRCLE 182 ON READER SERVICE CARD

Personal Code Explorer™


★ Novices
★ SWLs
★ Veterans
Receive Digital Signals
Copies FAX, RTTY, MORSE, SITOR, PACKET, and more from receiver to IBM/PC CGA, EGA, VGA screen. Easy to use and install. Extensive manual.
On-Screen Scope

Personal Code Explorer also features user friendly menus, digital noise filters, global frequency lists and a FAX to GIF file converter.
NOW SEE WHAT YOU'VE BEEN MISSING!

Personal Code Explorer - $129 S&H $4
Free Brochure. Call-Write-Order. MC/VISA.

Microcraft Corporation
Box 513RF, Thiensville, WI 53092
Phone (414) 241-8144

CIRCLE 98 ON READER SERVICE CARD

33rd ANNUAL
TROPICAL HAMBOREE
AMATEUR RADIO & COMPUTER SHOW
ARRL HAMFEST OF THE AMERICAS
FEBRUARY 6 - 7, 1993
DADE COUNTY YOUTH FAIR & EXPOSITION CENTER • MIAMI, FLORIDA
• Sponsored by Dade Radio Club of Miami, Inc.

• PROGRAMS & ACTIVITIES FOR EVERYONE • 200+EXHIBIT BOOTHS • DXCC FIELD CHECKING
• 800+INDOOR SWAP TABLES • FREE PARKING FOR 15,000 VEHICLES
• 300 CAMPSITES WITH HOOK-UPS & LAUNDRY FACILITIES • ON-SITE LICENSE EXAMS

SPECIAL EVENTS!!!
"HURRICANE ANDREW COMMUNICATIONS CRITIQUE"
"EXPANDED YOUTH FORUM WITH COMPLIMENTARY ADMITTANCE FOR STUDENTS"
"CONDUCTING AMATEUR RADIO CLASSES"
(Educational forum for teachers, class instructors and parents)
"FCC FORUM"
ALL THE ABOVE IN ADDITION TO USUAL HAMBOREE FESTIVITIES

Registration: $5.00 Advance — $6.00 Door (Tax Incl.) • Valid Both Days (Advance deadline Feb. 2)
Swap Tables: $20.00 each (Tax Incl.) + Registration • Power: $10.00 per User (Tax Incl.)
Campsites: 3 Days (Fri., Sat., Sun.) $40.00 (Tax Incl.) • 4 Days (Thurs., Fri., Sat., Sun.) $55.00 (Tax Incl.)
Headquarters Hotel: Miami Airport Marriott - $69.00 Single, Double + Tax
Call: (305) 649-5000 — Speak Only to Reservation Department
Must Mention "Tropical Hamboree" to Get Special Rate. Deadline Jan. 25, 1993
After Deadline, Special Rates on Room Available Basis Only • Alternate Facilities: Contact Hamboree Chairman

WRITE TODAY FOR DETAILS BROCHURE & RESERVATION FORMS
(Available Dec. 1st)

Send to: Chairman, Evelyn Gauzens, W4WYR
2780 N.W. 3rd Street, Miami, FL 33125
Tel: (305) 642-4139 • Fax: (305) 642-1648
(All checks for tickets, camping and tables should be made payable to: Dade Radio Club of Miami, Inc.)

CIRCLE 50 ON READER SERVICE CARD

the tech side

by Michael Jay Geier KB1UM

More Amplifiers

Last time, we explored amplifiers and oscillators. Let's continue.

Current Events

An amplifier can be thought of as a kind of power source. Really, the amplifier's power supply is the source but, because the amplifier delivers the power to its load, it acts like a source. Heck, for that matter, you'd have to go all the way back to the electric company's generator to get to the real source, unless, of course, you are using a battery. Looking at an amplifier as a source of power is very helpful in understanding its behavior and limits. Let's explore it.

Remember Ohm's law? It states that Voltage (E) equals Current (I) times Resistance (R). Seems pretty simple, right? It is, but it has far-reaching consequences. If you write it out as an equation, E=IR, you can also see that I=E/R and R=E/I. Let's look at the second one, I=E/R. Let's put a 10-volt battery and a 5-ohm resistor in a circuit. (Yes, I know there's no such thing as a 10-volt battery, but it's a much easier number to work with than, say, 13.8, and the law works the same in any event. Besides, it is possible to make a 10-volt battery, we just don't.) The equation tells us that 2 amps will be flowing in this circuit. And, since power (watts) is volts times amps, the circuit "consumes" 20 watts. Where does it really go? Well, if you touch that resistor, the burn you'll get will tell you! Yup, it gets converted to heat.

So what's the point? Well, let's try dropping the resistor to 2 ohms. Now, 5 amps are flowing and 50 watts are being consumed. It makes sense: The less resistance, the more power flows. But what if the battery simply can't provide that many amps? What happens then?

Back Her On Down

Batteries and, for that matter, all other electrical power sources, are finite in their current capacity. Nothing can supply infinite current, not even a nuclear power plant. Even so, Ohm's law, like other natural laws, can't be broken. So, how do we reconcile these two seemingly contrary facts? Well, remember that E=IR. In this case, we know that R is 2 ohms. Also, we can measure the battery's maximum current output. Let's say it turns out to be 4 amps. The equation tells us that the voltage required to pull 4 amps through 2 ohms will be 8 volts. But wait a minute, it's a 10-volt battery, right? Well, not anymore! If we measure it, we'll see that it is, indeed, now an 8-volt battery. That's why your car battery's voltage drops when you turn the key; it has finite current limits. Another way to look at it is to say that the battery has *internal resistance*. That resistance drops the voltage as current is pulled through it, just as does any resistor. In fact, power sources really do have internal resistances; that's why they get warm when lots of power is being transferred. And so do amplifiers.

Now that we've looked at power sources, let's think of an amplifier another way: as a kind of variable resistor. It takes power from the power supply and allows varying amounts of it to pass, depending on the input signal. In other words, the resistance changes along with the input signal. As a consequence, an amplifier has some limit to how much current it can provide. For that matter, so does a signal, which, after all, is just another source of power.

Supply and Demand

Let's say we make a crystal radio. We look at the signal coming off of the detector and it's about 1 volt. I know that's bigger than it really would be, but it's a convenient value for discussion, so let's stick with it for a moment. Now, we connect that signal to a small speaker. Hey, 1 volt across an 8-ohm speaker is 0.125 amps and also 0.125 watts. 125 milliwatts is plenty to make a little speaker fairly loud; most pocket tape recorders don't put out much more than that. So here it comes, right? Nothing. You can't hear a thing. What happened to it? If you measure that signal while the speaker is connected, you'll be lucky if you can find anything at all! It's just like the battery example above: The signal doesn't have enough *current capacity* to drive an 8-ohm load, so its voltage goes down to next to nothing. So what can we do about that?

Crank It Up

We can amplify it! This brings up the two kinds of amplifiers: voltage and current. If the signal were only 0.02

TigerTail™
Range Extender for 2 meter Handheld Radios
from AntennasWest
Box 50062F, Provo, UT 84605
1-801 373 8425

- Boosts Signal from Flex & 1/4 wave Antennas
- Lowers Radiation Angle
- Improves both Receive *and* Transmit
- Raises Low Power Performance
- Saves your Battery Pack

- Easy to Use
- Snaps on Handheld
- Unobtrusive
- Easily Concealed
- Adds No Bulk or Height
- Weighs only 1/3 oz.

Patent Pending Infopak $1

1-800-926-7373
Order Hotline

See and Hear the Difference
7.95 ppd

CIRCLE 107 ON READER SERVICE CARD

Spread Spectrum Scene

Happy Holidays!

Learn About the Exciting World of PCS, LANs, Digital Cellular, TDMA and CDMA.

Happy Holidays!

Tune in to Wireless LANs, MANs, WANs, PCNs, digital comm, CDMA systems and amateur radio spread spectrum:

- New products
- Tutorials
- Columns on: Antennas, DSP, Networking
- Construction Articles
- Regulatory News
- Software, Secret Signals & Technical Education

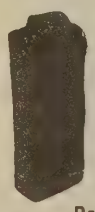
Holiday Special! 15 Issues only $29.95 US/$45.00 Foreign

Free sample issue: $.75 postage on 9" x 12" SASE
RF/SS, P.O. Box 2199, El Granada CA 94018
SUBSCRIPTIONS: 800-524-9285

MasterCard VISA

CIRCLE 97 ON READER SERVICE CARD

Isn't Your Radio Worth The Investment? Protect It With



THE PACK-IT
FROM TRANSEL TECHNOLOGIES
TRANSEL TECHNOLOGIES

Protect your HT's, Cellular Phones, Pagers, and any other devices you carry that may be subject to damage.

The PACK-IT is made of 1/4" neoprene material which is safety belt sewn to the nylon protective backing. The PACK-IT doesn't frey like many other materials and is safe to wash whenever needed.

The strap and 2" beltloop is made from commercial grade webbing and is secured in the front with a Velcro hook and loop assembly.

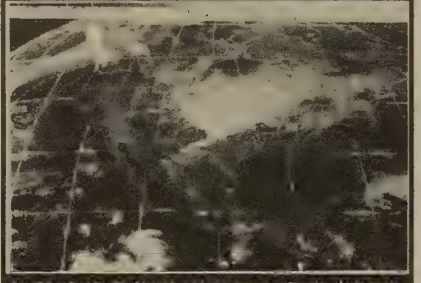
The PACK-IT doesn't wear the radio like leather and protects the radio from the small falls which occurs in everyday usage. The neoprene material is a cushion material which not only covers the radio but also protects it. Various sizes available so call for the size to fit your need.

Made In The USA!

$15.95 + $3.00 S&H
1 (800) 829-8321
Dealers Welcome

CIRCLE 11 ON READER SERVICE CARD

WEFAX To The Max



PC GOES/WEFAX 3.0 $250

PC GOES/WEFAX 3.0 is a professional fax reception system for the IBM PC. It includes an AM/FM demodulator, software, cassette tutorial and 325 page manaul. Check this partial list of our advanced features:

Res. up to 1280x800x256	APT Lat/Lon. Grids
Unattended Operation	Orbital Predcition
Colorization	Frame Looping
Zoom, Pan, Rotation	PCX & GIF Export
Contrast Control	Grayscale Printing
Tuning Oscilloscope	Infrared Analysis
Photometry/Histograms	Variable IOC & LPM

PC HF FACSIMILE 6.0 $99

PC HF Facsimile 6.0 is a complete shortwave FSK fax system for the IBM PC. It includes an FSK Demodulator, software, 250 page manual and tutorial cassette. Call or write for a complete catalog of products.

Software Systems Consulting
615 S. El Camino Real, San Clemente, CA 92672
Tel:(714)498-5784 Fax:(714)498-0568

CIRCLE 250 ON READER SERVICE CARD

HUGE NEW CATALOG

Call or write Universal today to receive your free 100 page catalog with prices!

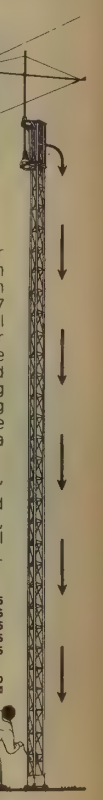
- Communications Receivers
- Portable Receivers
- Amateur Transceivers
- Amateur & SWL Antennas
- Scanners
- RTTY and FAX Equipment
- Books and Manuals
- All major lines: Kenwood, Icom, Yaesu, Alinco, MFJ, Japan Radio, AEA, Sony and Sangean.

This catalog is available FREE by fourth class mail, or for $1 by first class mail.

Universal Radio
6830 Americana Pkwy.
Reynoldsburg, OH 43068
◆ Tel. 614 866-4267
◆ Tel. 800 431-3939
◆ FAX 614 866-2339

Universal-quality equipment since 1942!

Enjoy NEVER CLIMBING YOUR TOWER AGAIN



Are you too scared or too old to climb? Never climb again with this tower and elevator tram system. Voyager towers are 13 and 18 inch triangular structures stackable to any height in 7 1/2', 8 3/4' or 10' section lengths. Easy to install hinge base, walk up erection. Next plumb tower with leveling bolts in base. Mount rotor and large heavy beams on Hazer tram and with one hand winch to top of tower for normal operating position. Safety lock system operates while raising or lowering. At last a cheap, convenient and safe way to install and maintain your beam. This is a deluxe tower system that you can enjoy today.

SPECIAL TOWER PACKAGE: 50 ft. high by 18" face tower kit, concrete footing section, hinged base, HAZER kit, Phillystran guy wires, turnbuckles, earth screw anchors, 10' mast, thrust bearing, tool kit, ground rod and clamp, rated at 15 sq. ft. antenna load @ 100 MPH, **$1974.95.**

50' by 13" wide tower, same pkg as above	$1670.95
HAZER 2 for Rohn 25-hvy duty alum 12 sq ft wind ld	324.95
HAZER 3 for Rohn 25-std alum 8 sq ft wind load	232.95
HAZER 4 for Rohn 25-hvy galv stl 16 sq ft wind ld	303.95
TB-25 Ball thrust bearing, 2½" max mast dia	74.95
NEW NEW NEW NEW NEW NEW HAZER VH-8 Transit System for Rohn 45, 22 sq ft wind load	860.00
HAZER VH-9 Transit System for Rohn 55, 22 sq ft wind load	

Satisfaction guaranteed. Call today and order by Visa, M/C or mail check. Immediate delivery.

Glen Martin Engineering, Inc.
Dept. A
RR 3, Box 322,
Boonville, MO 65233
816-882-2734
FAX: 816-882-7200

GLEN MARTIN ENGINEERING

CIRCLE 72 ON READER SERVICE CARD

volts, we would have to voltage-amplify it, because even if it had enough current to drive the speaker, 0.02 volts across 8 ohms is only 0.0025 amps and 0.00005 watts! That's not gonna make much noise, is it? But we know that the signal starts out at 1 volt, which is enough. What we need is to make that 1-volt signal be able to supply enough current that it *stays* at 1 volt when the speaker is connected. That is current amplification. In a real-life circuit, a tiny incoming signal is first voltage-amplified and then current-amplified to drive the load.

Presto Changeo

So how do you actually make voltages and currents bigger? Let's look at current first.

Amplifying devices, whether they be tubes or transistors, act like gates which control the flow of electrons through them. Open the gate and more electrons flow. Close it down and fewer do. As it happens, voltage corresponds to the energy state, or "kick," of each electron, while current corresponds to the number of electrons there are. So, amplifiers really control, and thus amplify, current. To make a voltage amplifier, you must employ yet another trick of Ohm's law to convert changes in current to changes in voltage.

Divide and Conquer

Let's say we put two resistors in series and connect them to a 10-volt power source. Go ahead and draw it on paper. Put one resistor above the other and connect them to a 10-volt battery. Label the top resistor as 10 ohms. Now, draw a line with an arrow through the bottom one. That indicates that it is variable. Remember, like I said before, an amplifier is really just a variable resistor, so let's pretend that the variable one is our amplifier, with the input signal turning the knob back and forth. Give the variable one a value of 10 ohms also. Now, draw a voltmeter connected across the variable resistor. Let's see what happens.

When they're both 10 ohms, the total resistance will be 20 ohms. The current will be 0.5 amp. It's important to remember that in a series circuit, the current (the number of electrons) is the same no matter where you look; it's the voltage (their energy kick) that changes. On our voltmeter, the voltage will be 5 volts, because 0.5 amps times 10 ohms equals 5. Now let's turn the knob until the bottom one is 5 ohms. What happens? Now the total circuit resistance is 15 ohms and the current is 0.6 amps. The voltage across that bottom resistor is now 3 volts. So, as the current being drawn changes (because the total circuit resistance changes), the ratio of how much voltage is dropped by each resistor changes. And, it changes in exactly the same way as the resistance itself! The closer the bottom resistor gets to zero, the less voltage is across it, which means that the top one is being forced to drop more. When the bottom one is zero ohms, its voltage drop is zero, and all the voltage is being dropped across the top one. So how does this make a voltage amplifier?

Captain Ratio Hornblower

Just a minute ago, I said that the voltage ratio of the two resistors varies along with the resistances themselves. That's the key: It's a *ratio*. As the bottom one gets much smaller than the top one, tiny changes in it cause *big* changes in the voltage. So, if we use a big resistor, say, 10,000 ohms, for the top one, then the numbers change really fast. When the bottom one is 200 ohms, the ratio is 10,000/200 or 50, meaning that the voltage where they meet will be 1/50 of the battery's voltage. But when the bottom one changes to 100 ohms, the ratio will be 10,000/100 or 100, meaning that the voltage will be 1/100 of the battery's voltage. Wow, that's some change! And that's how the changes in current are made into changes in voltage.

But It's Weak

Because it's a ratio, and thus a fraction, you can see that the bigger the numerator, the bigger the changes you'll get with small changes in the denominator. So, a big resistor on top helps you get lots of voltage gain. The price you pay is that the big resistance limits the current that can flow. If you have 100,000 ohms up there, the most current that can ever flow at 10 volts (which happens when the bottom resistor is zero ohms) is 0.1 milliamps. That's 0.1 thousandths of an amp! We sure can't move a speaker cone with that.

OK, so we've raised our tiny signal up enough that its voltage is high enough. Now, all we do is follow that amplifier stage with a current amplifier, just as I described before. Now we've got enough voltage *and* enough current to do the job. Voilà, that speaker is talking! And that is exactly how real amplifiers, from audio through RF, work. Of course, they don't use variable resistors. Instead, they use *gain elements* (tubes or transistors) to pull current through resistors. Or, they pull it through transformers, which is something we'll get into next time. Now, let's look at a letter:

Dear Michael,

I live in a mobile home. My HF antenna's ground radial wires are about four feet from my smoke alarm. When I tune up on 20 meters, it sets off the darned alarm. I've tried all kinds of grounding for my station, but it still does it. Is there any way around it?

Signed,
Alarmed

Dear Alarmed,

Four feet? It isn't surprising that something that can be heard in Tibet might cause some trouble to another circuit only four feet away! Ground radials are one half of your antenna, so you must consider them radiators of RF energy. Smoke alarms have solid-state circuits in them, and they act like rectifiers. In other words, your smoke alarm is a very deaf crystal radio set. Give it enough signal and, well, you get the idea. The only way you'll make this any better will be to move the antenna away. Besides, all that RF can't be doing *you* much good, either.

'Til next time, 73 from KB1UM. RF

VISA MasterCard

ICOM

Listen to "Let's Talk Radio" 7 nights a week 6pm to 12 pm on Spacenet-3, Transponder-21, Audio 6.2

VHF COMMUNICATIONS

9:00 am – 5:30 pm weekdays

Weekends and evenings by appointment.

453 Buffalo Street
Jamestown, New York 14701

Western New York's finest amatuar radio dealer.
PH. (716) 664–6345
(800) 752–8813 for orders only

CIRCLE 14 ON READER SERVICE CARD

DON'T READ THIS AD if you enjoy hard-to-use software.

EasyLog Plus, the advanced logging program, features:
•Icom & Kenwood TRX cntrl •CW keybd + iambic keyer •Contest/non-contest •Scrolling log display •Total database mng'mt •DXCC/WAS •Beamheadings •4 world time zone clocks •Voice recorder cntrl •Prints QSL reports & mailing labels •DOS shell •Too many features to list all •IF-3 Interface schem included. *Requires a 100% PC Compat -640k- Any display. Hard drive not required.*

"Now my main logging program...by far the best CW keybd." --J. Robbins, N0JR

EASYLOG less CW & trx cntr...**$30.00** **EASYLOG PLUS**.....**$40.00**
IF-3 VR/keyer interface..... **$40.00** **IFC–2K** TTL/RS232 conv.(kit)...**$45.00**
Add $3.00 s&h ($5.00 outside US) per item. AZ. residents add 5.5% st. tax.
US check or M.O. Send callsign w/ log order. SASE for info-pack.

RAI ENTERPRISES 4508 N. 48th Dr.; Phoenix, AZ 85031 USA

2 METER PERFORMANCE
The J Antenna

REAL GAIN & LOW SWR!
Comes fully assembled and tuned!
• Weatherproof •
Aluminum and
Stainless construction.
S. Douglas RF Devices
P.O. Box 246925
Sacramento, CA 95824-6925
(916) 688-5647
Please add $4.50 for shipping & handling

Only $27.50

CIRCLE 229 ON READER SERVICE CARD

SPY ON THE EARTH

See *live* on your PC what satellites in orbit see

Learn how you can benefit greatly from this exciting new technology. Send $30 ($35 air, $40 overseas) for our *fantastic* 12 diskette set of professional quality copyrighted programs (IBM type) that does satellite tracking, data acquisition, image processing, file conversion and much more. Diskette and information package includes all programs, satellite views, C language source code for a popular satellite image acquisition program, hardware schematics, catalog and discount certificate.

VANGUARD Electronic Labs
Dept. RF, 196-23 Jamaica Ave.
Hollis, NY 11423 Tel.718-468-2720

Oklahoma Comm Center

ALINCO ICOM YAESU

SPECIAL SPECIAL
CALL

For This Month's Special-Buy
Some Quantities Are Limited

FREE SHIPPING UPS SURFACE
(on purchases of $50.00 or more except antennas)

VISA MasterCard DISCOVER C.O.D.

3900 S. Broadway, Suite 6
Edmond, Oklahoma 73013
Local & Info (405) 359-9554
Fax (405) 359-9556

CALL TOLL FREE
1-800-70K-HAMS
1-800-765-4267

Hours of Operation
M-F 10-6
Sat 10-2
Showroom closed Mondays

SCARED OF THE CODE?

IT'S A SNAP WITH THE ELEGANTLY SIMPLE MORSE TUTOR ADVANCED EDITION FOR BEGINNERS TO EXPERTS—AND BEYOND

Morse Code teaching software from GGTE is the most popular in the world—and for good reason. You'll learn quickest with the most modern teaching methods—including Farnsworth or standard code, on-screen flashcards, random characters, words and billions of conversations guaranteed to contain every required character every time—in 12 easy lessons.

Sneak through bothersome plateaus in one tenth of a word per minute steps. Or, create your own drills and play them, print them and save them to disk. Import, analyze and convert text to code for additional drills.

Get the software the ARRL sells and uses to create their practice and test tapes. Morse Tutor Advanced Edition is approved for VE exams at all levels. Morse Tutor is great—Morse Tutor Advanced Edition is even better—and it's in user selectable color. Order yours today.

For all MS-DOS computers (including laptops).

Available at dealers, thru *QST* or *73* or send $29.95 + $3 S&H (CA residents add 7.75% tax) to:

GGTE, P.O. Box 3405, Dept. MS,
Newport Beach, CA 92659
Specify 5¼ or 3½ inch disk
(price includes 1 year of free upgrades)

CIRCLE 193 ON READER SERVICE CARD

SATELLITE T.V.

Factory Direct to Your Door
Echostar • Startrak • Houston Tracker • Orbitron

24 Hr. Pricing Hotline 516-763-6842

• Call for FREE Huge Color Catalog
• Domestic & International Systems
• Huge Savings!

Info & Orders
ECHOTRAK™ 305-344-6000

4749 NW 98th Lane • Coral Springs, FL 33076

CIRCLE 157 ON READER SERVICE CARD

Removable Call Signs
2 1/4" x 8" PLASTIC
ORDER NOW
AMATEUR RADIO
W1AW
• Your Call Letters or Repeater Freq
• Display Sign on Trunk or Rear Window
• Magnetic or Suction-Cup Mounted
• Transferable From Car to Car
• No Call Lettering Remains on Vehicle
Order -*Magnetic or Suction-Mounted Version!* Select -*Black, Blue or Red Background!* PRICE: $9.95 . . .2/$18.Club Discounts SASE Brings Info.
SIGNON
1923 Edward Lane
Merrick, NY 11566
Serving Ham Radio Over 12 Years

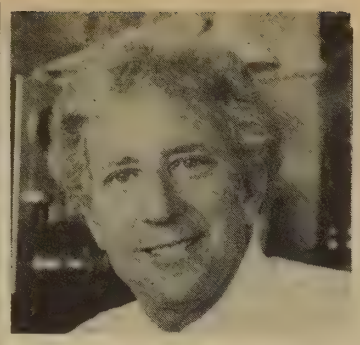
Satellite City
Check Us Out
Warranty Service
$4 Air charge*
No Card charge
Extended Hours
$4 For Air*
Extended Phone Hrs.
8am-8pm C.S.T.
* in Continental USA
1-800-426-2891

YAESU
FT-747 6X Winter Special

ICOM
IC-728A Winter Special

KENWOOD
TM-241A Winter Special

Complete Library including::
ARRL • RSGB • ARTSCI • W5YI
1-800-426-2891
METRO: (612) 786-4475
FAX: (612) 786-6513
2663 County Rd. I
Mounds View, MN 55112
Super Minnesota Watts 1-800-279-1503
CIRCLE 153 ON READER SERVICE CARD



upgrade don't stop now

by Gordon West WB6NOA

Understanding Polarity

A series of questions on the no-code Technician examination focused in on your knowledge of radio wave POLARIZATION. Understanding the importance of polarization will assist you in getting on the air with a more powerful signal to be received at the other end of the circuit—if that other station is using the same polarization! If you get your polarization wrong, you might suffer signal degradation by as much as 9 dB.

As radio waves zoom around out there in thin air, the wave consists of two components:

Magnetic lines of force
Electric lines of force

The radio wave contains both of these forces, each at right angles to each other. When we refer to radio wave polarization, and antenna polarization, we refer to the ELECTRIC lines of force, not the magnetic lines of force. It is the ELECTRIC lines of force that must be lined up with our antenna for best transmission and reception.

On the worldwide bands, 10 through 160 meters, amateur radio operators employ many different antenna systems with varying degrees of polarization:

Dipoles are horizontally polarized.

Mobile whips are vertically polarized.

Beams are usually horizontally polarized.

Cubical quads may be horizontally or vertically polarized.

Long wires are usually more horizontal than vertical.

Inverted V's look more like horizontal polarization.

Slopers are a little bit of both polarizations, depending on the feed.

When worldwide signals bounce off of the ionosphere, the refracted wave may begin to rotate in polarization. This is why some big ham radio operators who are antenna specialists may employ a diversity antenna system—the ability to instantly switch from horizontal polarization with a beam to vertical polarization with a roof-mounted seven-band vertical. This way, as the incoming radio wave begins to rotate, they can switch polarization in order to peak up signal performance.

Photo A. Straightening your dual-band whip to a vertical position will help your repeater and simplex range.

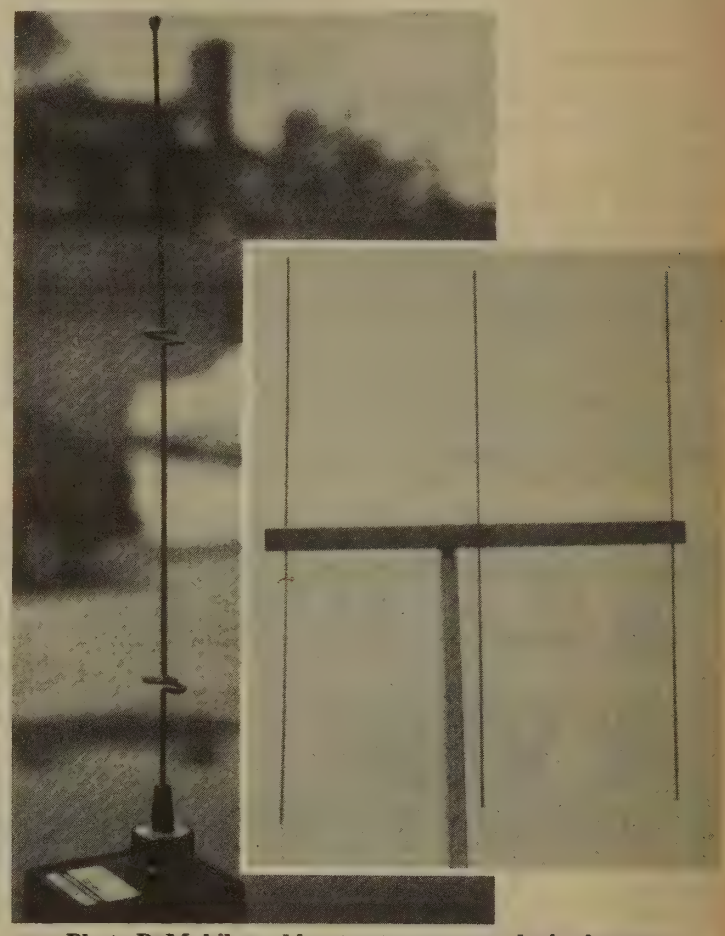


Photo B. Mobile and base antennas must be in the *same* polarization for simplex use.

Photo C. Try horizontal polarization on your mobile-to-mobile communications to beat vertical interference.

FOR WORLDWIDE SKYWAVE COMMUNICATIONS, SAME-POLARIZATION IS NOT IMPORTANT. Since the wave is constantly tumbling in polarization off of the ionosphere, you don't necessarily have to have a horizontal dipole to maintain communications with another ham 3,000 miles away on 10 meters with a horizontal beam. You will communicate quite nicely via skywaves from your vertical antenna to another station with a horizontal antenna.

Most high frequency amateur radio operators prefer horizontal polarization because it makes their antenna system less obvious to their neighbors. Horizontal polarization also cuts down on most man-made electrical noise that tends to be vertically polarized.

ON VHF AND UHF, SAME-POLARIZATION IS CRITICAL! On 2 meters, 220, 440, and the higher bands, your communications will travel on a line-of-sight basis, and a cross-polarized circuit between two antennas will dramatically reduce the effective range that you might be able to communicate. A small vertical 2 meter beam antenna will work simplex to a mobile vertical antenna as far away as 50 miles, sometimes even further. However, if you change the polarization of your 2 meter beam to horizontal, you won't be able to work that mobile vertical antenna more than about five miles away! That's right, a cross-polarized antenna system dramatically decreases range.

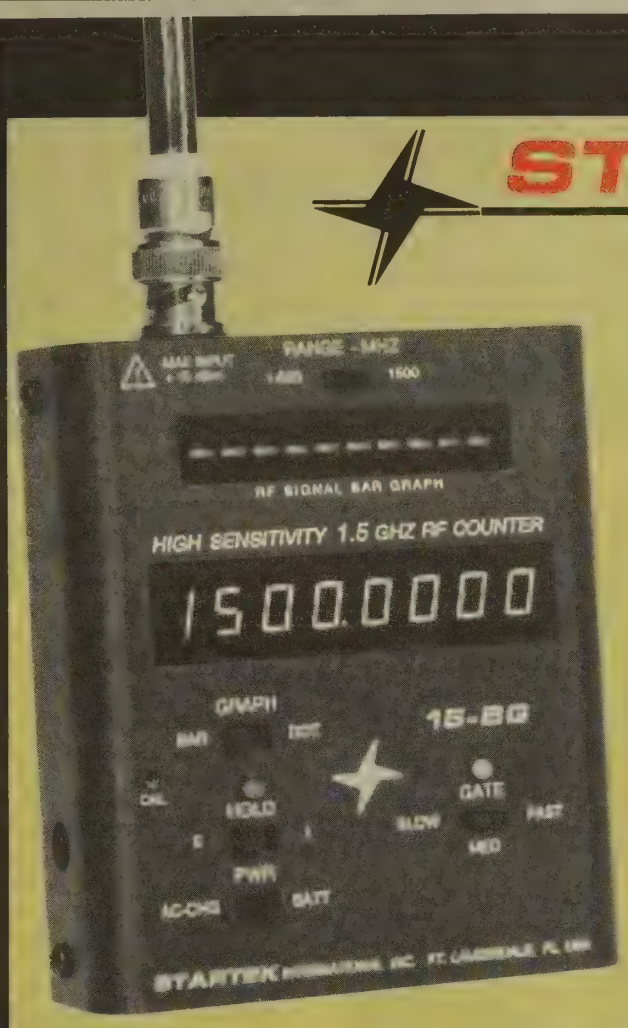
When talking on a hand-held transceiver, try to keep your small antenna system away from your eyes, and vertically polarized. This allows you better transmission and reception to a distant receiver. Same thing between two handhelds on simplex—your range will be dramatically reduced if you are holding your handheld straight up and down, and your friend is talking on a handheld that is horizontal with the earth. You'll immediately hear the difference when he straightens up his handheld and talks with the same polarization as you.

Two base stations may stay in touch on 2 meters or 440 MHz simplex (or for that matter, any VHF or UHF frequency) by switching over to horizontal polarization and using directional antennas. Horizontal polarization will cut down on the interference from vertically polarized stations on nearby frequencies. It might even cut out all of the interference from that low power mobile station that always seems to come up on the air when you are talking simplex to the other station 40 miles away. Try horizontal-to-horizontal antenna polarization to reduce vertical polarization interference from vertically polarized stations.

Almost all VHF and UHF repeaters operate vertically polarized. As long as you run a vertically polarized antenna you are all set. But to take advantage of 2 meter, 432 MHz, and 1296 MHz SSB long-haul simplex operation using single sideband, you'll need to switch over to a beam antenna with horizontal polarization. Almost all weak signal work using SSB on VHF and UHF is horizontally polarized. When the Hawaiian beacon and distant Hawaiian DX stations talk from Hawaii to California, we must all stay on horizontal polarization in order to make this record-breaking contact distance. For mobile use, horizontal mobile antennas are available for VHF and UHF from a company called M2 Electronics, 7560 N. Del Mar Avenue, Fresno CA; (209) 432-8873. These horizontal mobile antennas are the preferred choice by all weak signal operators throughout the country. They might also be used for mobile FM simplex operation where you wish to operate simplex between two mobile units and purposely cut down on vertical polarization reception.

And for satellite work, you will need to achieve circular polarization in order to reduce the fading effect on the tumbling OSCARS in space. Right-hand and left-hand circularly polarized antennas are available, and are easily recognized by their horizontal and vertical elements on a long boom. A special phasing harness determines the type of polarization you may wish to select.

So what's your polarization? Is it the same polarization as the station you are trying to talk to? You might want to check this out in order to improve your communications range. RF



STARTEK

FREQUENCY COUNTERS

MODEL 15-BG

ULTRA HIGH SENSITIVITY
RF DETECTOR - COUNTER
2 INCH LED BAR GRAPH

Regular $220. value !!

$169.

SPECIAL LIMITED TIME OFFER
PLEASE MENTION THIS AD FOR SPECIAL PRICE

STANDARD FEATURES FOR ALL 6 MODELS

- *3 to 5 HOUR* BATTERY PORTABLE OPERATION
- NI-CAD BATTERIES & 110VAC ADP/CHARGER INC.
- 1 PPM TCXO TIME BASE WITH EXTERNAL ADJ.
- 3 GATE TIMES, AUTO DECIMAL PLACEMENT
- HOLD SWITCH (WORKS PROPERLY- NO GATE CHG)
- 9-12VDC AUTO-POLARITY POWER INPUT
- StarCab™ QUALITY ALUMINUM CABINET
- COMPUTER AIDED CIRCUIT DESIGN
- TOP QUALITY COMPONENTS - SOCKETED IC's
- COMPATABLE WITH MFJ-207/208 ANT. ANALYZERS
- FULL YEAR PARTS & LABOR LIMITED WARRANTY
- DESIGNED & ASSEMBLED IN THE USA

STARTEK Bar Graph counters are *simply the best* for finding frequencies, testing, adjusting, repairing or locating RF devices. Superior sensitivity, longer battery operation, high quality USA construction and sub-compact size are just a few of the reasons to select a ***STARTEK*** counter.

ACCESSORIES:

#CC-90	BLACK VINYL CARRYING CASE	$12.00
#TA-90	TELESCOPING BNC ANTENNA	12.00
#P-110	PROBE, 200 MHZ, 1X-10X	39.00
#M207IC	CABLE FOR MFJ-207/208	10.00

SAME DAY SHIPMENT

FACTORY DIRECT ORDER LINES

Orders & Information
305-561-2211
Orders only
800-638-8050
FAX 305-561-9133

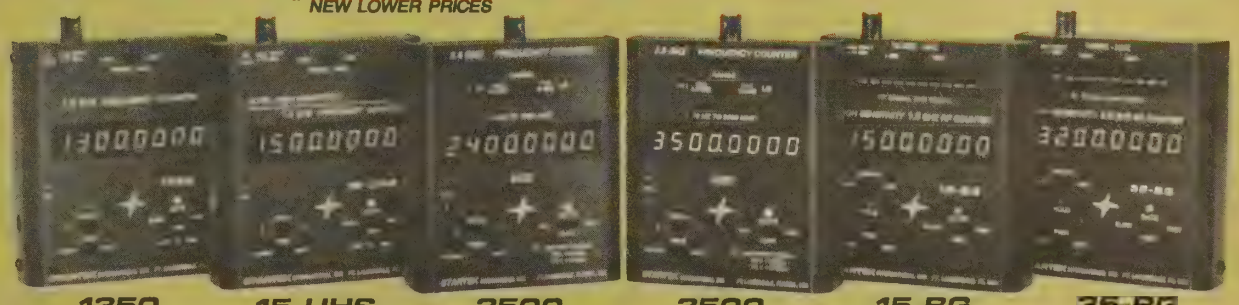
MasterCard VISA DISCOVER

TERMS: Shipping-handling charges for Florida add $4 + tax, US & Canada add 5% ($4 min - $10 max), others add 15% of total. COD fee $4. VISA, MC or DISCOVER accepted. Prices & specifications subject to change without notice or obligation.

STARTEK INTERNATIONAL INC
398 NE 38th St., Ft. Lauderdale, FL 33334

SELECT YOUR ***STARTEK*** *POCKET COUNTER™* TODAY !

* *NEW LOWER PRICES*



1350 — 1 MHZ - 1300 MHZ, QUALITY & ECONOMY (REPLACES #1500A), $129

15-UHS — 1 MHZ - 1500 MHZ, ULTRA HIGH SENSITIVITY (REPLACES #1500HS), *$159

2500 — 10 HZ - 2400 MHZ, HI-Z INPUT - LO RANGE, HIGH SENSITIVITY, *$189

3500 — 10 HZ - 3500 MHZ, HI-Z INPUT - LO RANGE, HIGH SENSITIVITY, $250

15-BG — 1 MHZ - 1500 MHZ, ULTRA HIGH SENSITIVITY, 2 INCH BAR GRAPH, $SPECIAL$

35-BG — 1 MHZ - 3200 MHZ, ULTRA HIGH SENSITIVITY, 2 INCH BAR GRAPH, $265

CIRCLE 247 ON READER SERVICE CARD

STS-47 SAREX

Spacelab Japan.

by Philip Chien KC4YER

On September 12th Dr. Jay Apt N5QWL became the first astronaut to fly on two shuttle missions with SAREX. Jay earned his ticket while training for his first mission, the STS-37 flight of April 1991. The pilot for that mission, astronaut Ken Cameron KB5AWP, encouraged the entire crew to get their ham licenses. The STS-47 mission was the first time a U.S. packet rig was flown on a high inclination (57 degree) shuttle mission, permitting high latitude hams around the world to communicate with *Endeavour* with packet hardware in addition to voice. While *Mir* has had packet for several years, STS-47 was the first U.S. packet mission which could reach higher latitudes.

Jay's fellow crew members teased him mercilessly about his enthusiasm for SAREX and kidded that, at least in his eyes, it was the prime payload for the mission. Actually, the primary payload was the Spacelab long module which has been used on several previous ham radio missions. This time the Spacelab customer was the Japanese space agency, NASDA. NASDA paid NASA $50 million for the joint mission, with microgravity experiments supplied by investigators from both the U.S. and Japan. In addition, STS-47 was the 50th shuttle flight, and the 25th flight since the *Challenger* accident.

The commander of the mission was Hoot Gibson and the pilot was Curt Brown. Jay's fellow mission specialists were Mark Lee and Jan Davis. The two payload specialists were NASA astronaut Mae Jemison, flying as a "science mission specialist," and Mamoru Mohri 7L2NJY, the first Japanese scientist in space. Jan and Mae worked with Jay on the blue shift; Curt, Mark, and Mamoru worked the opposite red shift. Unfortunately, Jay's shift placed him asleep for most passes over the United States, but the packet rig was left running for most of the mission. While Jay never convinced his fellow crew members to get their own ham licenses, he did convince commander Hoot Gibson and pilot Curt Brown to participate in two of the preplanned school contacts. In addition, Mamoru got to use the SAREX rig during the mission for a preplanned educational contact with the Australian University where he obtained his Ph.D. and for some random contacts over Japan.

Photo B. Astronaut Jay Apt N5QWL communicates with students using the SAREX 2 meter station on board the *Endeavour*.

Photo A. A picture-perfect liftoff for the space shuttle *Endeavour* (STS-47).

The press referred to this launch as the first on-time shuttle launch since 1985. In reality, every launch which launches within the launch window (the period of time where a launch can occur and meet the mission's objectives) is "on time." Launch Director Bob Sieck stated: "If you make too big a deal about it being on time, then if you launch one five minutes or 15 minutes late it would be looked at as a negative thing and that's not the case. What counts is when you do launch, the machine is 100% operational and it's ready to support a safe and successful mission. It's still just as good a launch, even if it goes an hour or so late." It's more accurate to say that the launch was the first launch since 1985 which occurred at the beginning of the launch window. While an interesting tidbit for space trivia collectors, it also made tracking the shuttle much easier. *Endeavour* was placed into an accurate orbit where it remained for its week in space. Since the microgravity experiments required as few maneuvers as possible, it turned out that pre-launch Keplerian elements, prepared several months in advance, were accurate enough to use for the entire mission!

School Contacts

Within a couple of hours after reaching orbit, Jay, Jan and Mae were off to bed as the rest of the crew activated the Spacelab experiments. When Jay came on duty one of his early

Continued on page 18

CD-ROM
Headquarters!

Phone 1-904-493-0505 Free Catalog on DISK and PRINTED catalog
1-800-841-6570 C.O.D. orders only.

Catalogs sent with order.

We have almost everything available,specify preference when ordering!

CD-1 500 Best Games.....ONLY $49.95
CD-2 1000 Best Educational Programs.....ONLY $49.95
CD-3 1100 Best Business Programs.....ONLY $49.95
CD-4 All of the above + over 3000 in all!.....ONLY $139.95
CD-5 Over 20,000 Software Programs on 3 CD set!.....ONLY $139.95
CD-6 The MONSTER CD over 6000 programs.....ONLY $99.95
Collect all of these CD's for over 30,000 Programs!
This is probably ALL the software you'll ever need!
All of these CD sets are Different! Collect em ALL.

GIANT COLLECTION ON FLOPPYS
NEWEST AVAILABLE ANYWHERE!
$29.95 specify 3 1/2 or 5 1/4 disks
At least 10 High Density Disks!

Free SHIPPING
With Paid Order!

C.O.D. add $4.00
Shipping add $3.00
SAVE C.O.D./Shipping!
Mail Check or M.O.
TO

N4ZDU SHAREWARE
P.O. BOX 40
Oldtown,FL. 32680

CIRCLE 21 ON READER SERVICE CARD

DON'T MISS OUT!

SUBSCRIBE TO

Radio Fun

FOR ONLY $12.97!

12 GREAT ISSUES!

cribe Now! 12 issues for $12.97.

dio Fun for the low price of $12.97.

16. (In New Hampshire, call 603-924-0058).

se print) Call

Zip

ayment enclosed

. date

_QST Subscriber___CQ Subscriber___

te $24. Basic subscription rate $14.97. 05J

CONTACT YOUR ADVERTISERS EASILY!

FILL OUT THIS FREE READER SERVICE CARD AND SEND IT TODAY!

DER SERVICE CARD

January 1993

THIS CARD VALID UNTIL 2/28/93

7	8	9	10	201	202	203	204	205	206	207	208	209	210
17	18	19	20	211	212	213	214	215	216	217	218	219	220
27	28	29	30	221	222	223	224	225	226	227	228	229	230
37	38	39	40	231	232	233	234	235	236	237	238	239	240
47	48	49	50	241	242	243	244	245	246	247	248	249	250
57	58	59	60	251	252	253	254	255	256	257	258	259	260
67	68	69	70	261	262	263	264	265	266	267	268	269	270
77	78	79	80	271	272	273	274	275	276	277	278	279	280
87	88	89	90	281	282	283	284	285	286	287	288	289	290
97	98	99	100	291	292	293	294	295	296	297	298	299	300
107	108	109	110	301	302	303	304	305	306	307	308	309	310
117	118	119	120	311	312	313	314	315	316	317	318	319	320
127	128	129	130	321	322	323	324	325	326	327	328	329	330
137	138	139	140	331	332	333	334	335	336	337	338	339	340
147	148	149	150	341	342	343	344	345	346	347	348	349	350
157	158	159	160	351	352	353	354	355	356	357	358	359	360
167	168	169	170	361	362	363	364	365	366	367	368	369	370
177	178	179	180	371	372	373	374	375	376	377	378	379	380
187	188	189	190	381	382	383	384	385	386	387	388	389	390
197	198	199	200	391	392	393	394	395	396	397	398	399	400

FORMATION 05M

dvertised in this issue of Radio Fun circle
uiry. Offer valid in the U.S. and possessions only.

NO OTHER MAGAZINE BRINGS YOU THE EXCITING WORLD OF AMATEUR RADIO LIKE

73 Amateur Radio Today

2 ISSUES ONLY $19.97!

3 Holiday!

all) of 73 for the low price of $19.97!
e) Mail this postage paid card today.
800-289-0388 (In CO., call 303-447-9330).

(please print) Call

State Zip

ed ☐ Bill me
☐ Visa ☐ Amex

Exp. date

Basic subscription rate $24.97 (Canadian orders $1.40 GST; other foreign countries add $19.00 per 2.00 per year for airmail. Please allow 4-6 weeks 4QBX2

	PG
onics	29
	18
	27
	25
	30
	5
	23
	11
	11
	16
r	13
	10
	23
	26
	17
	10
	30
	25
	17
	13
	9

RS#	ADVERTISER	PG
32	Ryan Communications	27
153	Satellite City	14
•	Sign On	14
238	Software for Amateur Radio.	23
244	Software Systems	11
250	Software Systems	12
97	Spread Spectrum Scene	12
247	Startek	15
93	Tejas RF Technologies	10
269	Tigertronics	21
299	Townsend Electronics	18
11	Transel Tech.	12
50	Tropical Hamboree	11
190	U.S. Digital	18
136	Unadilla Antenna Mfg. Co.	10
•	Universal Radio	12
•	Vanguard Labs	13
70	Vectronics Corporation	7
14	VHF Communications	13
104	Vis Study Guides, Inc.	10
•	Yaesu Electronics Corp.	CV3

s?

aged! I'm beside myself and I'm flabbergasted!

t *Radio Fun* has been around for a whole year, and you *still* haven't

are that *Radio Fun* is the *only* amateur radio magazine devoted to gh we pack every issue of *Radio Fun* with easy construction projects, views of new and vintage gear . . . not to mention our columnists, ng you learn more about, and have more fun with, amateur radio?

our past indiscretions and start fresh. We'll send you 12 issues of gly generous price of $12.97. Hey . . . that's almost 1/2 off the cover nient postcard attached to the center of this magazine, or you can 2346, and charge your subscription. Either way, let's get this taken

***Fun* for only $12.97! Call 1-800-257-2346.**

• *Advanced Technology*
• *Enduring Value*

cComm

Hesperides St., Tampa, FL 33614-7618
-2980 Fax: (813)872-8696 (800)486-7388

ding Provider of Packet Equipment for Amateur Radio

Get a beginner's packet setup, for only $65!
ort modem for your PC and a 'software TNC' diskette
lug into the PC serial port and connect to your radio
Order BayMod-9 or Baymod-2

CIRCLE 152 ON READER SERVICE CARD

STS-47 SAREX

Spacelab Japan.

by Philip Chien KC4YER

On September 12th Dr. Jay Apt N5QWL became the first astronaut to fly on two shuttle missions with SAREX. Jay earned his ticket while training for his first mission, the STS-37 flight of April 1991. The pilot for that mission, astronaut Ken Cameron KB5AWP, encouraged the entire crew to get their ham licenses. The STS-47 mission was the first time a U.S. packet rig was flown on a high inclination (57 degree) shuttle mission, permitting high latitude hams around the world to communicate with *Endeavour* with packet hardware in addition to voice. While *Mir* has had packet for several years, STS-47 was the first U.S. packet mission which could reach higher latitudes.

Jay's fellow crew members teased him mercilessly about his enthusiasm for SAREX and kidded that, at least in his eyes, it was the prime payload for the mission. Actually, the primary payload was the Spacelab long module which has been used on several previous ham radio missions. This time the Spacelab customer was the Japanese space agency, NASDA. NASDA paid NASA $50 million for the joint mission, with microgravity experiments supplied by investigators from both the U.S. and Japan. In addition, STS-47 was the 50th shuttle flight, and the 25th flight since the *Challenger* accident.

The commander of the mission was Hoot Gibson and the pilot was Curt Brown. Jay's fellow mission specialists were Mark Lee and Jan Davis. The two payload specialists were NASA astronaut Mae Jemison, flying as a "science mission specialist," and Mamoru Mohri 7L2NJY, the first Japanese scientist in space. Jan and Mae worked with Jay on the blue shift; Curt, Mark, and Mamoru worked the opposite red shift. Unfortunately, Jay's shift placed him asleep for most passes over the United States, but the packet rig was left running for most of the mission. While Jay never convinced his fellow crew members to get their own ham licenses, he did convince commander Hoot Gibson and pilot Curt Brown to participate in two of the preplanned school contacts. In addition, Mamoru got to use the SAREX rig during the mission for a preplanned educational contact with the Australian University where he obtained his Ph.D. and for some random contacts over Japan.

Photo B. Astronaut Jay Apt N5QWL communicates with students using the SAREX 2 meter station on board the *Endeavour*.

Photo A. A picture-perfect liftoff for the space shuttle *Endeavour* (STS-47).

The press referred to this launch as the first on-time shuttle launch since 1985. In reality, every launch which launches within the launch window (the period of time where a launch can occur and meet the mission's objectives) is "on time." Launch Director Bob Sieck stated: "If you make too big a deal about it being on time, then if you launch one five minutes or 15 minutes late it would be looked at as a negative thing and that's not the case. What counts is when you do launch, the machine is 100% operational and it's ready to support a safe and successful mission. It's still just as good a launch, even if it goes an hour or so late." It's more accurate to say that the launch was the first launch since 1985 which occurred at the beginning of the launch window. While an interesting tidbit for space trivia collectors, it also made tracking the shuttle much easier. *Endeavour* was placed into an accurate orbit where it remained for its week in space. Since the microgravity experiments required as few maneuvers as possible, it turned out that pre-launch Keplerian elements, prepared several months in advance, were accurate enough to use for the entire mission!

School Contacts

Within a couple of hours after reaching orbit, Jay, Jan and Mae were off to bed as the rest of the crew activated the Spacelab experiments. When Jay came on duty one of his early

Continued on page 18

CD-ROM Headquarters!

Phone 1-904-493-0505 Free Catalog on DISK and PRINTED catalog
1-800-841-6570 C.O.D. orders only.

Catalogs sent with order.

We have almost everything available,specify preference when ordering!

CD-1 500 Best Games.....ONLY $49.95
CD-2 1000 Best Educational Programs.....ONLY $49.95
CD-3 1100 Best Business Programs.....ONLY $49.95
CD-4 All of the above + over 3000 in all!.....ONLY $139.95
CD-5 Over 20,000 Software Programs on 3 CD set!.....ONLY $139.95
CD-6 The MONSTER CD over 6000 programs.....ONLY $99.95
Collect all of these CD's for over 30,000 Programs!
This is probably ALL the software you'll ever need!
All of these CD sets are Different! Collect em ALL.

GIANT COLLECTION ON FLOPPYS
NEWEST AVAILABLE ANYWHERE!
$29.95 specify 3 1/2 or 5 1/4 disks
At least 10 High Density Disks!

Free SHIPPING With Paid Order!

C.O.D. add $4.00
Shipping add $3.00
SAVE C.O.D./Shipping!
Mail Check or M.O. TO

N4ZDU SHAREWARE
P.O. BOX 40
Oldtown,FL. 32680

CIRCLE 21 ON READER SERVICE CARD

DON'T MISS OUT!

SUBSCRIBE TO

Radio Fun

FOR ONLY $12.97!

12 GREAT ISSUES!

CONTACT YOUR ADVERTISERS EASILY!

FILL OUT THIS

FREE

READER SERVICE CARD

AND SEND IT TODAY!

NO OTHER MAGAZINE BRINGS YOU THE EXCITING WORLD OF AMATEUR RADIO LIKE

73 Amateur Radio Today

2 ISSUES ONLY $19.97!

DON'T MISS OUT!
SUBSCRIBE TO
Radio Fun
FOR ONLY $12.97!

12 GREAT ISSUES!

CONTACT YOUR ADVERTISERS EASILY!

FILL OUT THIS
FREE
READER SERVICE CARD
AND SEND IT TODAY!

NO OTHER MAGAZINE BRINGS YOU THE EXCITING WORLD OF AMATEUR RADIO LIKE

73 Amateur Radio Today

12 ISSUES ONLY $19.97

Radio Fun

Subscribe Now! 12 issues for $12.97.

__**YES!** Send me one year (12 issues) of Radio Fun for the low price of $12.97.

For instant service call toll free **1-800-257-2346**. (In New Hampshire, call 603-924-0058).

Name (please print) Call

Address

City State Zip

Charge my: ❒ MC ❒ Visa ❒ Payment enclosed

Card Number Exp. date

Class License_____Year Licensed___ 73 Subscriber___QST Subscriber___CQ Subscriber___

Canada add $8. Foreign add $12 surface, $36 airmail. Newstand rate $24. Basic subscription rate $14.97. **05J**

Radio Fun

READER SERVICE CARD

January 1993

THIS CARD VALID UNTIL 2/28/93

NAME CALL

ADDRESS

CITY STATE ZIP

Where did you get this copy of Radio Fun?

A ❒ Newsstand B ❒ Subscription

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400

FREE PRODUCT INFORMATION

05M

Reader Service: To receive more information on the products advertised in this issue of Radio Fun circle appropriate number. Please allow 6 weeks for processing of inquiry. Offer valid in the U.S. and possessions only.

Ham it up this Holiday!

❒ **YES! Send me 1 year (12 issues in all) of 73 for the low price of $19.97! (Save over $15.00 off the cover price) Mail this postage paid card today. For instant service call toll free: 800-289-0388 (In CO., call 303-447-9330).**

Name (please print) Call

Address

City State Zip

❒ **Payment enclosed** ❒ **Bill me**

Charge my: ❒ **MC** ❒ **Visa** ❒ **Amex**

Card Number Exp. date

Newsstand rate $35.40. Basic subscription rate $24.97 (Canadian orders add $7.00 per year plus $1.40 GST; other foreign countries add $19.00 per year for surface mail, $42.00 per year for airmail. Please allow 4-6 weeks for delivery of first issue. **4QBX2**

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO 211 MANCHESTER NH

POSTAGE WILL BE PAID BY ADDRESSEE

Radio Fun

PO Box 4926
Manchester NH 03108-9839

Place
Stamp
Here

Radio Fun

READER SERVICE MANAGEMENT DEPARTMENT
PO BOX 8708
BOULDER CO 80329-8708

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 1199 BOULDER CO

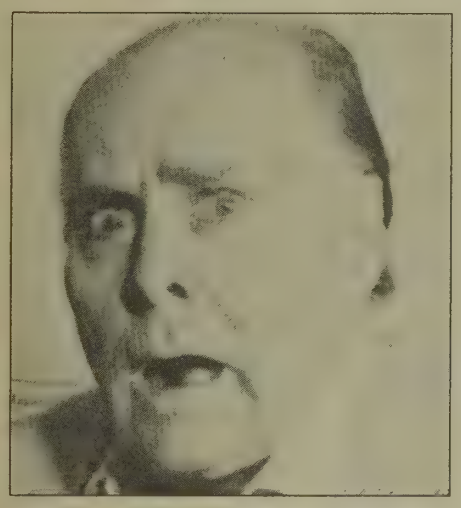
POSTAGE WILL BE PAID BY ADDRESSEE

73 Amateur Radio Today
P.O. BOX 50330
BOULDER CO 80321-0330

advertiser index

RS#	ADVERTISER	PG
18	A.S.A.	29
•	Advanced Electronic Applications	CV2
107	Antennas West	12
16	Astron Corporation	20
17	ATV World	25
92	Azden Corporation	CV4
105	Battery Tech, Inc.	8
184	C & S Sales, Inc.	26
146	Creative Control Products	18
252	D&D Cliff Dweller Antenna	23
•	Dayton Hamvention	19
229	Douglas RF Devices	13
239	Douglas RF Devices	29
114	E. H. Yost	11
157	Echotrak	13
•	Electronic Distributors	27
193	GGTE	13
72	Glen Martin Engineering	12
182	Handie-Base	11
300	Hart Publishing	3
55	J-Com	26
84	JLP Computers & Electronics	29
2	Kawa Productions	18
234	Lentini Communications	27
274	M2 Enterprises	25
101	Maxcom, Inc.	30
86	MFJ Enterprises	5
162	Michigan Radio	23
98	Microcraft Corp.	11
114	Mr. Nicad	11
21	N4ZDU Shareware	16
•	Oklahoma Comm Center	13
73	Orchid City Software	10
•	P.C. Electronics	23
•	P.C. Electronics	26
152	PacComm	17
68	Periphex	10
132	Quement Electronics	30
110	Radio Amateur Satellite	25
•	Radio Fun	17
•	RAI Enterprises	13
34	Ramsey Electronics	9
32	Ryan Communications	27
153	Satellite City	14
•	Sign On	14
238	Software for Amateur Radio.	23
244	Software Systems	11
250	Software Systems	12
97	Spread Spectrum Scene	12
247	Startek	15
93	Tejas RF Technologies	10
269	Tigertronics	21
299	Townsend Electronics	18
11	Transel Tech.	12
50	Tropical Hamboree	11
190	U.S. Digital	18
136	Unadilla Antenna Mfg. Co.	10
•	Universal Radio	12
•	Vanguard Labs	13
70	Vectronics Corporation	7
14	VHF Communications	13
104	Vis Study Guides, Inc.	10
•	Yaesu Electronics Corp.	CV3

What are you . . . nuts?



Our founder, Wayne Green W2NSD, upon hearing that you were not yet subscribing to *Radio Fun*.

I'm shocked! I'm outraged! I'm beside myself and I'm flabbergasted!

You mean to tell me that *Radio Fun* has been around for a whole year, and you *still* haven't subscribed?

Even though you're aware that *Radio Fun* is the *only* amateur radio magazine devoted to the newcomer? Even though we pack every issue of *Radio Fun* with easy construction projects, interesting news, great reviews of new and vintage gear . . . not to mention our columnists, who are devoted to helping you learn more about, and have more fun with, amateur radio?

OK. We'll just forget your past indiscretions and start fresh. We'll send you 12 issues of *Radio Fun* for the amazingly generous price of $12.97. Hey . . . that's almost 1/2 off the cover price! Just use the convenient postcard attached to the center of this magazine, or you can call toll free, 1-800-257-2346, and charge your subscription. Either way, let's get this taken care of.

1 year of *Radio Fun* for only $12.97! Call 1-800-257-2346.

HandiPacket PORTABLE PACKET CONTROLLER

"One of PacComm's Handipackets is Aboard the MIR Space Station Listen for U2MIR on 145.55 MHz"

PacComm

- Advanced Technology
- Enduring Value

4413 N. Hesperides St., Tampa, FL 33614-7618
(813) 874-2980 Fax: (813)872-8696 (800)486-7388

Leading Provider of Packet Equipment for Amateur Radio

Get a beginner's packet setup, for only $65!
A serial port modem for your PC and a 'software TNC' diskette
Simply plug into the PC serial port and connect to your radio
Order BayMod-9 or Baymod-2

CIRCLE 152 ON READER SERVICE CARD

MORSE CODE MUSIC?

New-Powerful-Breakthrough, All 43 Morse Code characters sent with a rhythmic beat. A fun & easy way to learn or retain Morse Code skills. Now the secret is yours! order "THE RHYTHM OF THE CODE"™ Version II cassette today!

Send $9.95 and we'll pay the shipping to:

KAWA PRODUCTIONS
P.O. Box 319-RF.
Weymouth, MA 02188.

Check or money order only. We ship all orders within 10 days. Outside U.S.A. please add $2. for air mail. MA residents please add 5% sales tax.

CIRCLE 2 ON READER SERVICE CARD

SRC-10
REPEATER/LINK
CONTROLLER

DTMF muting
Intelligent ID'er
Auxiliary outputs
Easy to interface
Alarm monitor input
Telemetry response tones
Low power CMOS, 22ma @ 12v
Detailed application manual
Programmable COS polarities
Repeater & link courtesy tones
Synthesized link/remote base capability

$149.00 Assembled & Tested

CREATIVE CONTROL PRODUCTS
3185 Bunting Avenue
Grand Junction, CO 81504
(303) 434-9405

CIRCLE 146 ON READER SERVICE CARD

Simplex Repeater System

- Handie Talkie ready
- 32 or 65 Second operation
- 2 mode operation, Announce or Repeater
- Plugs into spk/mic jacks
- 32K bit operation
- Commercial quality 3.2 kHz pass band
- Emergency coordination tests and drills
- Club meetings announcements
- Temporary repeater service's
- Range extenders
- Great for solar powered
- Hiking, fishing, back packing, exploring
- Licensed to your call
- Great wired into your mobile

$166.00 + S.H. US Currency

Radio Not included Icom & Yaesu Ready

$22.50 Optional Leather Case

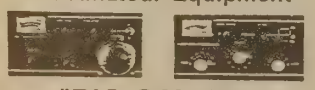
It's Amazing what Simplex can do Better!

US Digital Co
380 Rougeau Ave
Winnipeg, MB.
Canada R2C 4A2

US Money Order - Prompt Service
Certified Cheque - Prompt Service
Personal Cheque- Clearing Time
phone (204) 661-6859

CIRCLE 190 ON READER SERVICE CARD

Townsend Electronics, Inc.
presents
C.M. Howes Kits
for
H.F. Amateur Equipment



"RIG SAVER"
H.T. and Mobil Mounts

THE WORLD'S BEST
in ham radio books and publications
28 page catalog $1.00
Outside USA $2.00
1-219-594-3661
Townsend Electronics, Inc.
Box 415R • Pierceton, IN 46562

CIRCLE 299 ON READER SERVICE CARD

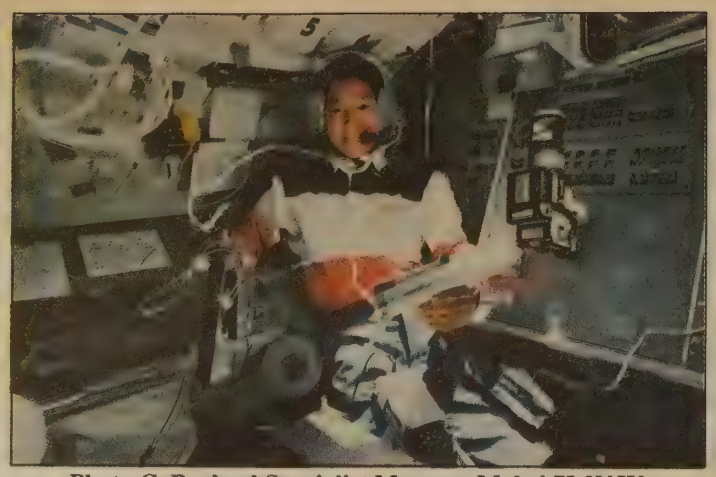


Photo C. Payload Specialist Mamoru Mohri 7L2NJY, the first Japanese scientist in space, makes a few 2 meter contacts from the shuttle.

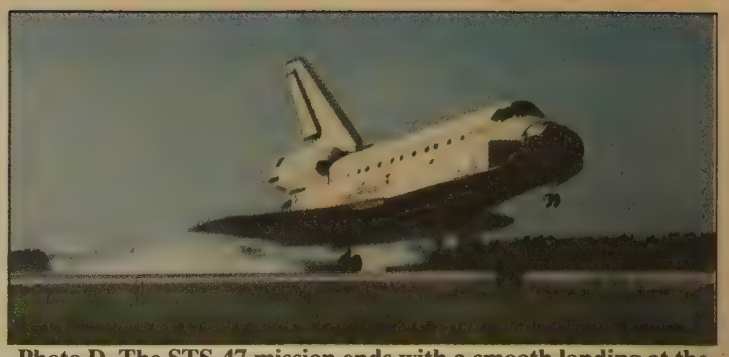


Photo D. The STS-47 mission ends with a smooth landing at the Kennedy Space Center after eight days in space.

SAREX

Continued from page 16

tasks was to set up the SAREX hardware in the packet mode.

The preplanned school contacts for STS-47 included: Vine Hill Elementary School, Scotts Valley, California (near Santa Cruz); McKinley High School, Honolulu, Hawaii; Cary High School, Cary, North Carolina (near Raleigh); and (all in Australia) Wesley College, South Perth; Flinders University, Adelaide; and Australian Maritime College, Launceston. Jay helped select the schools, who had all produced excellent proposals describing how they would use the contact to help teach students about ham radio and the space program. Hoot Gibson talked to students at Vine Hill Elementary School, Curt Brown talked to students at Cary High School, and Mamoru Mohri talked to Flinders University, the place where he had obtained his Ph.D. many years earlier. An additional school was added to the scheduled contact list late in the mission planning: Randolph High School in Huntsville, Alabama, where Jan Davis had graduated.

For each of the school contacts several SAREX team members monitored the contact from the Johnson Space Center. They were available to answer questions or assist if anything wasn't going properly. The Honolulu contact with McKinley High School was planned months in advance, but just days before *Endeavour*'s launch a hurricane struck the Hawaiian Islands. Control operator Dick Flagg WH6CJU confirmed that the Hawaiian students still wanted to talk to Jay. Apparently they weren't going to let a hurricane get in their way!

Communications Backup

One of the earliest justifications for SAREX was its capability to serve as a backup to NASA's communications network. On the highly unlikely chance that something would disable the normal shuttle-to-ground communications loops while leaving

SAREX 1993

1993 is going to be a fantastic year for SAREX hams. Three shuttle missions in a row will include ham astronauts in a wide variety of different modes and there are several other exciting opportunities for potential additional SAREX flights later in the year.

STS-55

The first SAREX flight for 1993 will be STS-55, the second flight of Spacelab Germany (Spacelab D2). Unlike the first German Spacelab mission in 1985, where ham contacts were limited primarily to Europe, this mission will include both U.S. and German astro-hams, and worldwide preplanned and random contacts. The U.S. hams are shuttle commander Steve Nagel N5RAW and payload commander Jerry Ross N5SCW, both veterans of the STS-37 mission. Steve is an extremely experienced astronaut, with flights on *Discovery*, *Challenger*, and *Atlantis*, and was the first astronaut to fly as a mission specialist, pilot, and commander. His second mission was as the pilot of the first German Spacelab mission. Jerry has also flown on three shuttle missions, including two where he performed space walks. Both German payload specialists, Hans Schlegel and Ulrich Walter, have ham licenses. The other U.S. astronauts will be pilot Tom Hendrix, making his second flight, and mission specialists Charles Precourt and Dr. Bernie Harris, both making their first shuttle missions.

Unfortunately, this mission will fly in a 28.5 degree orbit, making contacts more difficult for hams at higher latitudes. Fortunately, much of the German hardware developed for the Spacelab D1 mission, including an external antenna mounted on the rear of the Spacelab long module, will be used, permitting higher quality and multiband contacts.

The current plans call for two sets of ham transceivers on the nine-day mission: the German hardware, with an external antenna mounted on the rear of the Spacelab module, and the standard SAREX C (packet and voice) configuration within the shuttle's crew cabin with the window-mounted antenna. The SAREX team hopes to have the paperwork completed to permit the astronauts to carry the hand-held Motorola 300S transceiver into the Spacelab module where it can be hooked up to the external antenna. The outside antenna has much better performance, but operations in the Spacelab module would be limited to voice-only, using self-contained battery packs for power.

Since STS-55 will be a low inclination mission school, contacts will be performed via a phone bridge. The German hams have indicated that they will attempt a school contact via an HF link with a bridge station located in Kenya.

STS-56

The second ham flight for 1993 will be the STS-56 mission in March. Ken Cameron KB5AWP is the commander and the rest of the crew will be pilot Steve Oswald and mission specialists Mike Foale KB5UAC, Ken Cockrell KB5UAH, and Ellen Ochoa KB5TZZ. The primary payload will be ATLAS-2, a reflight of many of the earth observation instruments from the highly successful STS-45 ATLAS-1 SAREX mission. The crew will also deploy and retrieve a scientific platform during the eight-day mission. This will be a high inclination mission, and SAREX will be flown in all of its different modes: voice, packet, two-way slow-scan television and uplinked fast-scan television. It's worth noting that this will be the first high inclination fast-scan television mission, and the first slow-scan high inclination mission since Tony England's 1985 Spacelab 2 mission.

Mike Foale got to fly on the first ATLAS mission, STS-45. He didn't have a ticket for that flight, but he did make several educational contacts with students from his native United Kingdom. Ken has been encouraging his entire crew to get their licenses, and it would be highly unlikely for any astronaut on this mission to fly without a ham license.

STS-57

The third SAREX flight for the year STS-57, currently planned for April, will be pilot Brian Duffy N5WQW's second mission. His commander will be Ron Grabe, and the mission specialists will be Dave Low, Janice Voss, Jeff Wisoff, and Nancy Sherlock. This week-long mission will feature the retrieval of the European EURECA, a microgravity platform which was launched by the shuttle last August. The crew will also operate and tend dozens of mid-deck experiments in Spacehab, a new crew cabin expansion. The SAREX hardware for this low inclination mission will consist of the -C configuration, with packet and voice capabilities.

With three missions in a row there are plenty of opportunities for random contacts via several modes, and many potential educational contacts. If you're interested in participating in an educational contact then proposals should be sent to the ARRL as quickly as possible.

Other Missions

There are several other potential SAREX missions later in the year. Two veteran space travelers showed up at the Johnson Space Center in November for mission specialist training. The STS-60 mission, currently scheduled for November, will include an extremely unusual crew member—a Russian cosmonaut. As part of increased relationships between NASA and the Russian Space Agency, a Russian will get to fly on the STS-60 mission. The two cosmonauts chosen for the STS-60 mission are Vladimir Titov and Sergei Krikalev U4MIR. The U.S. crew members will consist of commander Charlie Bolden, pilot Ken Reightler, and mission specialists Franklin Chang-Diaz, Jan Davis, and Ron Sega. The two cosmonauts will spend the next year learning how to operate the shuttle and its systems. One cosmonaut will fly aboard *Discovery* on a week-long mission which will feature the Spacehab crew module extension and the first flight of the Wake Shield Facility. The other cosmonaut will serve as the backup. Since both are licensed amateur radio operators, SAREX may get another international journey. In 1995 a U.S. astronaut will fly a long-term *Mir* mission, ending with the shuttle rendezvousing with *Mir* and an astronaut-cosmonaut exchange.

One potential SAREX mission has been delayed from 1993 to 1994. Dr. Linda Godwin N5RAX is the payload commander for the Space Radar Laboratory mission. This will be a high inclination mission and an excellent opportunity for educational and random contacts.

Other astronauts have expressed an interest in participating in SAREX on their upcoming missions. In addition, crews for several upcoming missions have not been announced yet, and there are a handful of ham astronauts available for upcoming flight assignments.

Changes in the Astronaut Office

Dr. Kathy Sullivan N5YYV, a veteran of three shuttle missions, has been nominated for a new role, the head of the National Oceanographic and Atmospheric Administration (NOAA). In 1978 she was one of the first six female astronauts selected by NASA and in 1984, on her first shuttle mission, she performed the first female U.S. spacewalk. During her second shuttle mission in 1990 she helped deploy the Hubble Space Telescope. Her third shuttle mission was in 1992 aboard the highly successful ATLAS-1 mission, where she completed several educational SAREX contacts, and random QSOs with hams on all seven continents (yes—seven). NASA's loss is NOAA's gain—an excellent scientist and oceanographer with a view of the earth's environment which few have seen.

Dan Brandenstein, the head of the astronaut corps, left the space agency last fall. The new acting head of the astronaut corps is David Leestma N5WQC. This is the first time a ham has held that position (and also the first time for a non-pilot).

The 1992 class of candidate astronauts includes at least one who lists amateur radio as a hobby. US Navy Commander Charles E. Brady Jr., a Mission Specialist candidate, will make his first flight in the second half of this decade and has expressed an interest in participating in SAREX.

enough shuttle resources for the crew to return safely, a ham radio could be the only means of communications.

During the STS-47 mission a computer went down in White Sands at the TDRSS ground terminal on September 19 at approximately 8:10 a.m. GMT, and Mission Control was unable to send messages to the crew. The crew could still send messages to the ground but quickly realized that they were not receiving any responses. A preplanned SAREX contact was coming up on that pass and Australian ham Andy Joyce VK4KIV contacted the shuttle. Jay stated that he had a good quality signal, and quickly asked Andy to make a long distance phone call to the Johnson Space Center! Andy informed Jay that Doug Loughmiller KO5I was already monitoring their conversation from Mission Control's Customer Support Room. Andy forwarded the message from Mission Control, "The TDRS link is down and they are working the problem. Lost a computer at White Sands." Jay replied that the High Data Rate Recorder was in its record mode with 12.2% of its capacity remaining, and that the crew would take no further action unless Mission Control had anything to recommended.

As they were speaking, the White Sands engineers were able to start the backup computer, restoring communications with the crew. The first thing Jay Apt told capcom Bill McArthur was that the crew already knew about the problem because they were informed via SAREX. Jay then told the Australian hams that everything was back to normal and commented, "It proves the utility of ham radio." The contact marked the first time SAREX was used to back up the shuttle's communications circuits.

Packet and Voice Contacts

Jay's schedule limited him to only a handful of random voice contacts with hams in Hawaii, South Africa, and New Zealand. Few U.S. voice contacts were possible because Jay was asleep for most of those passes, but thousands of worldwide hams tried to contact *Endeavour* via the packet ROBOT.

The work list, hams who successfully contacted the shuttle and received an acknowledgment, had 456 contacts. The "heard" list, hams who got their callsigns through but did not successfully transmit an acknowledgment, had over 1,000 callsigns. All together, the counter had over 8,800 attempts to connect with the packet rig, including multiple connect requests from the same callsign. Hams in over 40 countries, including Iraq and Cuba, successfully made contact with Jay's packet rig.

Many of the members of the SAREX team, including several of the ham astronauts, feel that with packet the only requirements for a completed contact should be for the ham to transmit his/her call to the receiver (shuttle orbiter) without requiring an additional hang-up confirmation. The heard list was stored on the crew's onboard microcomputer and modemed to the Johnson Space Center amateur radio club using the shuttle's conventional data links. W5RRR retransmitted the heard list via packet BBSes during the mission, permitting a rapid feedback for those who successfully contacted the shuttle.

The QSL route for STS-47 voice (N5QWL/7L2NJY) and packet (W5RRR-1) is: Jay Apt N5QWL, 806 Shorewood Drive, Seabrook TX 77586, USA. Include a self-addressed stamped envelope (SASE). Non-US stations should include a self-addressed envelope with $0.50 U.S. postage affixed or appropriate IRCs enclosed. Include the callsign worked, date, UTC, mode, and frequency. For packet contacts (worked), include the QSO number issued by the robot; heard contacts should include a printout of the received QRZ beacon with your call in it. SWL QSLs: Include the callsign heard, date, UTC, mode, and frequency.

Besides SAREX, the crew cabin also included the Protein Crystal Growth, Israeli Space Agency Investigation About Hornets, and Solid Surface Combustion Experiment—small astronaut-monitored experiments. Unfortunately, SAREX had to share the PGSC (Payload and General Support Computer) with some of the mid-deck payloads. When the PGSC was in use for other experiments, the packet TNC stored the heard list within its own memory.

DAYTON Hamvention® '93

April 23, 24 & 25, 1993

Early Reservation Information

General Chairman, Dave Grubb, KC8CF — Asst. General Chairman, Ken Allen, KB8KE

✷ Giant 3 day Flea Market ✷ Exhibits ✷ Activities for the Non-Ham

Information
General Information: (513) 454-1456
FAX: (513) 890-5464 Attn: Hamvention,
or, write to
Hamvention, Box 964, Dayton, OH 45401-0964
Lodging Information: (513) 223-2612
(No Reservations by Phone)
Flea Market Information: (513) 454-1880 Daytime
(513) 767-1107 Evening

Lodging
Please write to **Lodging, Dayton Hamvention, Chamber Plaza, 5th & Main Streets, Dayton, OH 45402-2400** or refer to our 1992 Hamvention program for a listing of hotel/motels in the Dayton area.

Special Awards
Nominations are requested for Amateur of the Year, Special Achievement and Technical Excellence awards. Refer to the Hamvention Program for nomination form or contact Hamvention Awards Chairman, Box 964, Dayton, OH 45401-0964.

1993 Deadlines
Award Nominations: March 1
Advance Registration and Banquet:
USA - April 2 Canada - March 26
Flea Market Space: February 1

Flea Market
Flea Market Tickets (valid all 3 days) will be sold IN ADVANCE ONLY. No spaces sold at gate. A maximum of 3 spaces per person (non-transferable). Electricity is now available in a portion of the last Flea Market row for $40 additional per space. Rental tables and chairs are not available in the Flea Market. Vendors ***MUST*** order an admission ticket when ordering Flea Market spaces. Please send a separate check for Flea Market space(s) and admission ticket(s). Spaces will be allocated by the Hamvention committee from all orders received by February 1. Please use 1st class mail *only*.

Notification of Flea Market space assignment will be mailed by March 15, 1993. Checks will not be deposited until after the selection process is complete.

HAMVENTION Is sponsored by the Dayton Amateur Radio Association Inc.

Dayton Hamvention 1993
Advance Registration

Reservation Deadline: USA -April 2, Canada-March 26
Flea Market Reservation Deadline: February 1

Enclose check or money order for amount indicated in U.S. dollars and type or print your name and address clearly.

Make checks payable to:
Dayton HAMVENTION
Mail to - Dayton Hamvention Box 1446, Dayton, OH 45401-1446

	How Many		
Admission (valid all 3 days)	_____	@ $11.00*	$_____
Grand Banquet	_____	@ $22.00**	$_____
Alt. Act. Luncheon (Saturday)	_____	@ $8.00	$_____
(Sunday)	_____	@ $8.00	$_____
Flea Market ‡	_____	$30/1 space	
(Max.3 spaces)	_____	$60/2 adjacent	
	_____	$150/3 adjacent	$_____
Electricity	add _____	$40.00/space	$_____
Covered tent	_____	$215.00 ea.	$_____
		Total	$_____

Name _____
Address _____
City _____
State Zip+4_____- _____ – _____
Daytime Phone # ( )_____Evening Phone # ( ) _____

* $14.00 at door
**$24.00 at door, if available

Whenever Jay had a chance he would transfer the TNC's memory to the PGSC where it could be permanently saved on a floppy diskette. Unfortunately, the high number of hams trying to contact the shuttle resulted in the TNC overrunning its buffer several times when the PGSC was occupied supporting other experiments. The packet beacon constantly broadcast the last 31 callsigns in the heard list, and logs are desperately needed to fill in the blanks. If you do have a log please send it to Jay Apt N5QWL, 806 Shorewood Drive, Seabrook, TX 77586, USA.

This SAREX mission was the first high inclination packet mission for a U.S. ham aboard a crewed spacecraft. And thanks to the packet setup a new record was set for the number of QSLs on a mission and Jay got the first packet WAC from the shuttle.

Comments from Crew Members

As usual, I asked the various STS-47 crew members how they felt about SAREX, especially the non-hams who participated in the school contacts.

Jay Apt: *I think ham radio is a superb hobby for people to get into. It encourages technical competence. It encourages people from different countries to get together to talk on the radio. We had eight sessions where we talked directly to school kids in a two-way conversation throughout the world. In addition, we had contact with amateur radio operators in 41 countries around the world.*

Hoot Gibson: *I had the opportunity to contact a school in Santa Cruz, and I very much enjoyed the opportunity to talk to someone other than the capcoms and the flight directors. Now, we enjoy talking to the capcoms and the flight directors, but I also very much enjoyed the opportunity [to talk to the students] even more so than I thought I was going to. I knew it was going to be an enjoyable experience and I got a real kick out of it. I think SAREX is a wonderful payload to be carrying. We teased our flight engineer Jay Apt mercilessly about SAREX being the primary payload. But it was a wonderful thing to carry, and it stirs up a lot of interest in the public and I think it's something we should definitely continue to fly.*

Curt Brown: *I had the chance to contact a school very close to my home town in North Carolina. This was my first experience with SAREX and it was a very nice experience. I was amazed talking to some of the folks back home all the effort and the science and the education that the kids went through preparing to make the contact. It wasn't a matter of they just all gathered in a room one day and us flying over and saying hello. They did a lot of research and a lot of effort and preparation. I think they learned a great deal from just that part, plus the contact talking to somebody in orbit, they had some great questions and it was a great interface.*

Mamoru Mohri: *I got to communicate with Flinders University in Australia where I graduated. I talked with several scientists there. We could discuss science matters we are flying on board. I talked to my previous supervisor in Flinders, and I talked what kind of microgravity aspects, and what kind of background was necessary to conduct this kind of experiment. I was very much happy to talk to them.*

When I flew over Japan I tried to contact Japanese amateur ham radio operator people. I flew [over the] southern part of Japan and had a chance to talk with a person from Okinawa. One more [Japanese] person, I don't know where he's located. I very much enjoyed it. Especially when I talked with Flinders University. [When I talked to the Japanese hams] that was the first time I used Japanese from space—using amateur radio. I hadn't experienced communications with amateur radio using Japanese, even though I had a Japanese license for a long time, so it was the first time and I really enjoyed that.

Jan Davis told the students at Randolph High School: *This is a wonderful opportunity to be able to talk to you. Especially those of you studying at school. It's very inspirational to be able to share my experiences with you. I just encourage you to keep studying hard in school.* RF

ASTRON CORPORATION
9 Autry
Irvine, CA 92718
(714) 458-7277

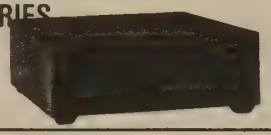
ASTRON POWER SUPPLIES
• HEAVY DUTY • HIGH QUALITY • RUGGED • RELIABLE •

MODEL VS-50M

SPECIAL FEATURES
- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES



MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅝ x 9¾	11

RS-L SERIES

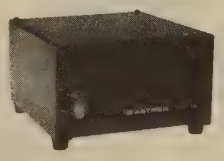
MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7

RM SERIES MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES


MODEL RS-7A

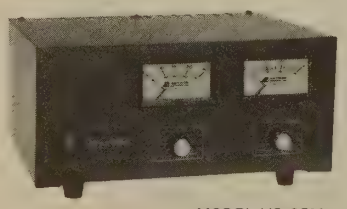
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES


MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

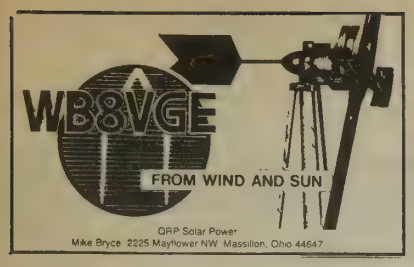
MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD



radio magic

by Michael Bryce WB8VGE

Choosing a New Radio

Have you been thinking about buying a new radio this new year but have no idea what you want? This month we'll look at some of the features and some specifications you'll need to know about in making your decision. I'll give you some of my opinions on what I find I need in a radio, and leave the final decision up to you.

Price

Scanning through the ads in *Radio Fun*, you'll soon be overloaded with information from the various radio manufacturers. It's very easy to get confused with today's high technology. Let's take a look at the first thing that everyone looks at—price.

Only you know what you can afford and what you would like to have in a new rig. There is a difference! Sure, I'd like an IC-781, but I know I can't afford one. So, I look at what is more in my price range. Having said that, let me also state that when comparing radios, only compare specifications for radios in the same price class. Compare apples to apples.

I have always had a hard time shelling out money for a new radio. Like everyone else, I always try to get the most radio for the least amount of dollars. Today, you might as well figure on spending from $800 to $1,000 for a basic rig. To get a few more features, you'll need to up the budget to $1,000 to $1,800. Both figures are for models without a power supply and, in most cases, without an antenna tuner. (Many of today's radios have built-in antenna tuners.) You can find some rigs for under a grand, and they'll talk just as well and just as far as the more expensive units will.

For starters, sensitivity, the ability to hear a signal, will be about the same for a $1,000 radio as for a $2,000 radio. There might be a slight improvement in sensitivity with the more expensive radio, but you'll need a shack full of laboratory test equipment to tell the difference. Only 10 years ago, that was not true. The older gear did suffer from low sensitivity, especially on the higher bands, namely 15 and 10 meters. However, with today's low noise FET (Field Effect Transistors) RF amplifiers and RF mixers, sensitivity is not a factor to be concerned with.

Selectivity and Filters

Selectivity, the ability to separate one signal from another, is a factor that needs to be considered. One way to reduce the cost of a radio is by eliminating some of the filters needed to produce a very selective radio. Most radios come with a standard 2.4-kHz-wide SSB filter. This filter is usually made up of two or four crystals. The more crystals per filter, the better the filter. At 2.4 kHz, this is just enough filtering to provide casual rag-chew copy. If QRM gets too heavy, this filter will fall down, leaving you with missed contacts.

To increase the amount of filtering usually means spending more money. A good choice for an SSB filter would be 2.1 kHz wide using a crystal lattice filter made up of six to eight crystals. These are expensive and don't reflect the true cost of the radio. Expect to spend about $80 to $150 for each additional crystal filter. Sometimes you can get a better filter in exchange for the stock unit installed as the radio comes from the factory. Check this out before you purchase extra SSB filters.

Check about purchasing a used filter(s). Crystal filters don't just go bad, and the saving in money may allow you to get some other option you desire.

Sometimes, you can install a second SSB filter in your rig. Normally you'll find a 1.8 kHz six-pole filter for SSB as the next available filter. This filter tightens up the bandwidth of the radio just to the point of making the SSB audio unreadable. A 1.8 kHz filter is also used for some of the digital modes such as AMTOR or packet. If you're considering RTTY, then a radio with the option of installing this second IF filter would be desirable. You can also use this 1.8 kHz filter for CW as it is narrower than the 2.1 kHz SSB filter and wide enough for good sounding CW. I for one don't like to listen to CW using an extremely narrow filter. I like to hear what's on either side of me.

Several companies allow you to choose where in the IF chain the filter will be placed. This can become confusing—proceed with caution. Sometimes you can install a 500 Hz CW filter for the 9 MHz IF and not be allowed to install one in the 455 IF chain. Again, check with the company that makes your rig about filter options.

You'll more than likely want a better CW filter than the SSB filter used. Normally, the basic radio uses the SSB filter for CW work. At 2.4 kHz, it's too wide for serious CW work. As mentioned above, the 1.8 kHz filter is a good in-between filter for both QRM fighting on SSB and narrow enough on CW to be usable. If you're a real dyed-in-the-wool CW fanatic, then you'll want a rig that will allow you to add one or more CW filters. The normal CW bandwidth is a 500 Hz six-pole filter. An even tighter filter of 250 Hz using four poles is possible, but with such a narrow filter, tuning in a station becomes rather tricky.

I'd go with a radio that allows a combination of crystal filters that can be switched independent of the mode. I'd install a 2.1 kHz eight-pole SSB filter, a 1.8 kHz six-pole filter for digital work and QRM fighting for contest SSB, and a 500 Hz six-pole filter for serious CW work. Check with the different manufacturers in the price class you're working with. Many radios will not allow you to switch filters independent of the operating mode. If you want to use the 2.1 kHz filter on CW, the radio should let you do so. Many radios will allow you to cascade all the filters together. So, by using the 2.1 kHz, the 1.8 kHz and finally the 500 Hz filter, you have a possible total of 24-pole crystal filter!

Check out the specifications when looking at selectivity. Many times the manufacture specs out the rig using the optional crystal filter and not the one that comes with the basic radio. Don't forget the added cost of the filters. At an average of $80 bucks each (you'll need at least two), that's quite a bit extra to come up with. Check with the dealer about having any extra filters installed at the time you purchase the radio. This may save you lots of hassle, especially if you're not up to working with the cramped insides of a modern radio.

With sensitivity and selectivity out of the way, we have little to compare one brand against the other. Now, there are other factors that we should look into, such as phase noise and transmit power. We'll look at these next month.

Bells and Whistles

What we have next to choose from is bells and whistles. Ever since the introduction of the microprocessor into ham radio, we have been overwhelmed with more and more features available with our radios. What used to require a separate box to hold a remote VFO is now done with software. The microprocessor gives us more bells and whistles than most hams use or will ever need. Now comes some soul searching: "How much money do you want to spend on bells and whistles?"

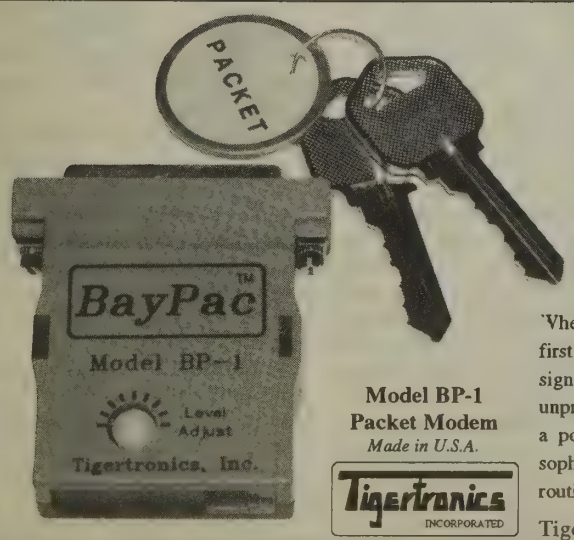
A good example is memories. No, not the ones that you have stored in your head from last year's vacation, but memories to store band, mode and other related data. If one model you're looking at has 50 memories, and another model has 90 memories, does that make for a better radio? If so, then 100 memories would make a third model better than the second. Gets kinda confusing. The only difference may be in how you can use these memories. With some radios you can't tune the memories and that can slow you down if you're really into contesting. In some models, you can't scan the memories. For me, that's no drawback, but maybe for you it's a function you really need. Don't get me wrong—going from operating a radio without memories is like switching from B/W TV to color TV.

There are all kinds of other features available today, and the list keeps getting longer. Many of the features, to me, are just overkill. I see no reason for a radio to record received audio (it is a nice feature if you're into contesting). A cheapie tape recorder will work just as well, and save you a lot a money in the process. One feature that I do like is the built-in antenna tuner. No, they won't tune out the reactance of a bedspring, but they will allow you to go on the air with an antenna slightly out of resonance. Note that most internal auto antenna tuners will only work for the transmitter side. In other words, they are taken out of the receive line and then are switched in for transmit. If you want a rig with an internal antenna tuner, it's cheaper to purchase it already installed in the rig than to install it later on.

As I mentioned early on, today's rigs have dual VFOs. Do you need dual VFOs on EACH band? If not, then why pay for a feature you won't be using? Now, it might sound like I'm against all these new features, but I'm really not. It just seems that all the companies making radios have run out of basic solid RF design and have been running on adding more and more features to their transceivers. I have noticed that companies like Kenwood and Yaesu have been working on newer receiver designs. ICOM has been working on newer final PA stages using high voltage transistors and even power MOSFETS. They have also been working on new receiver designs. Things like digital signal processing and capacitor switched filtering are becoming standard equipment in today's newest radios.

So where does all of this leave us? Well, I like a basic radio that will perform as specified. I don't want to add to the cost of the radio by having to add on basic needs such as filters. I like just enough bells and whistles to make the radio a pleasure to operate. I also enjoy operating a radio that has large enough controls to operate. Small push-buttons and tiny concentric controls that are hard to operate make even the best radio in the world a pain to use. I also want something that I can repair myself. Since my station operates from solar power, I require a transceiver that won't kill the batteries sitting there just receiving stations. I also need a transceiver without the high voltage PA. It needs to run and be happy on a 12-volt supply.

And that is where we will pick up next month. We'll look at a variety of other features on today's rigs and do a little bit of shopping. RF



- Packet Radio -

Portable & Affordable!

★ Simple Installation ★ Perfect For Portable
★ No External Power ★ Assembled & Tested
★ Smart Dog™ Timer ★ VHF, UHF, HF (10M)

Model BP-1
Packet Modem
Made in U.S.A.

Tigertronics INCORPORATED

'Vhether you're an experienced packeteer or a newcomer wanting to explore packet for the first time, this is the solution you've been waiting for! Thanks to a breakthrough in digital signal processing, we have developed a tiny, but full-featured, packet modem at an unprecedented low price! The BayPac BP-1 will transform your PC-compatible computer into a powerful Packet TNC. Although deceptively simple in appearance, the BP-1 supports sophisticated features like digipeating, file transfers, and remote terminal access, in addition to routine message handling. **Here is YOUR CHANCE to join the PACKET REVOLUTION!**

Tigertronics, Inc. 400 Daily Lane Post Office Box 5210 Grants Pass, OR 97527

Just... $49.95 + Shipping

GET YOURS TODAY!

Toll Free Order Line

1-800-8BAYPAC

(1-800-822-9722)

VISA Available Now! MasterCard

(503) 474-6700 *Fax* (503) 474-6703

CIRCLE 269 ON READER SERVICE CARD

Joe Carr K4IPV

antennas, etc.

by Joseph J. Carr K4IPV

Meet the Noise Bridge

One of the minor causes of all that racket on the ham bands is people tuning antennas and antenna tuning units. It can be argued that such tuning is illegal because it requires us to throw a carrier on the air, allowing the antenna to radiate. That signal tends to be of a duration from seconds to minutes, and effectively ruins that frequency for anyone who wishes to use it. There are, however, methods that can be used for making such adjustments without a carrier signal. We will take a look at these in this, and several upcoming, editions of this column. In this month's effort, let's take a look at the noise bridge.

A noise bridge uses a kinda-gaussian "white noise" generator as the signal source. Other than that, it looks very much like any RF bridge instrument, but uses the receiver as the detector. A typical noise generator uses a reverse biased zener diode as the noise source. The avalanche process of the zener when the source voltage exceeds the zener potential normally produces scads of noise. I've found these noise sources good into the VHF region, although it gets a bit weak above 6 meters. Following the zener diode with a good, high-gain wideband amplifier produces the level of signal needed to drive the bridge. Some noise bridges have a 1,000 Hz square-wave generator chop the noise signal, and these seem to work better in practical terms (although the bridge operation is unaffected).

Several commercial noise bridge products have been made for amateur radio operators over the years. At one time, the Omega-T bridge was available. It had only a single control for the resistive component of the antenna impedance. These "little green boxes" are still seen (used) at hamfests, although they are no longer made, to the best of my knowledge. Currently, there are at least two noise bridges on the market: The Palomar Engineers (Box 455, Escondido CA 92025; 619-747-3343) unit (Photo 1A), and the MFJ Enterprises (P.O. Box 494, Mississippi MS 39762; 800-647-1800), unit (Photo 1B). Both of these designs have two controls, one each for reactance (±X) and resistance (R).

If you want to build a noise bridge, then most recent editions of the ARRL *Radio Amateur's Handbook* have projects. Also, see my own book, *Practical Antenna Handbook* (TAB Books Cat. No. 3270; Blue Ridge Summit PA 17294; 800-233-1128).

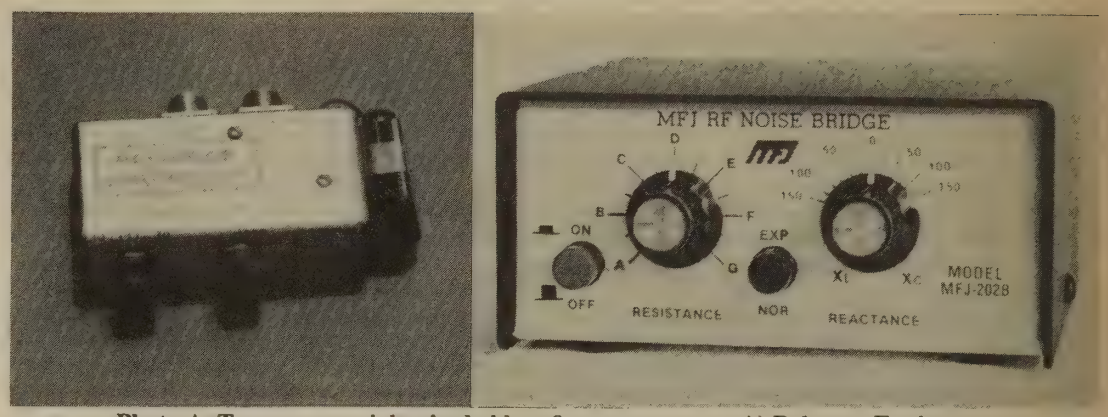


Photo A. Two commercial noise bridges for amateur use: A) Palomar Engineers; B) MFJ Manufacturing.

Figure 2 shows the connection of the noise bridge to the receiver and the antenna. The receiver should be one that is equipped with an S-meter because you will be looking for sudden "dips" in the noise level. The coaxial cable between the receiver and the noise bridge can be any length theoretically, but I've found that a very short length works best. The dips were less distinct, and the signals weaker, when long lengths were used. However, don't take the "short length" idea to extremes, for I've also noted that a three-foot section of RG-58/U coaxial cable did not overly affect the operation of the unit. The coaxial cable to the antenna is the antenna's normal feedline.

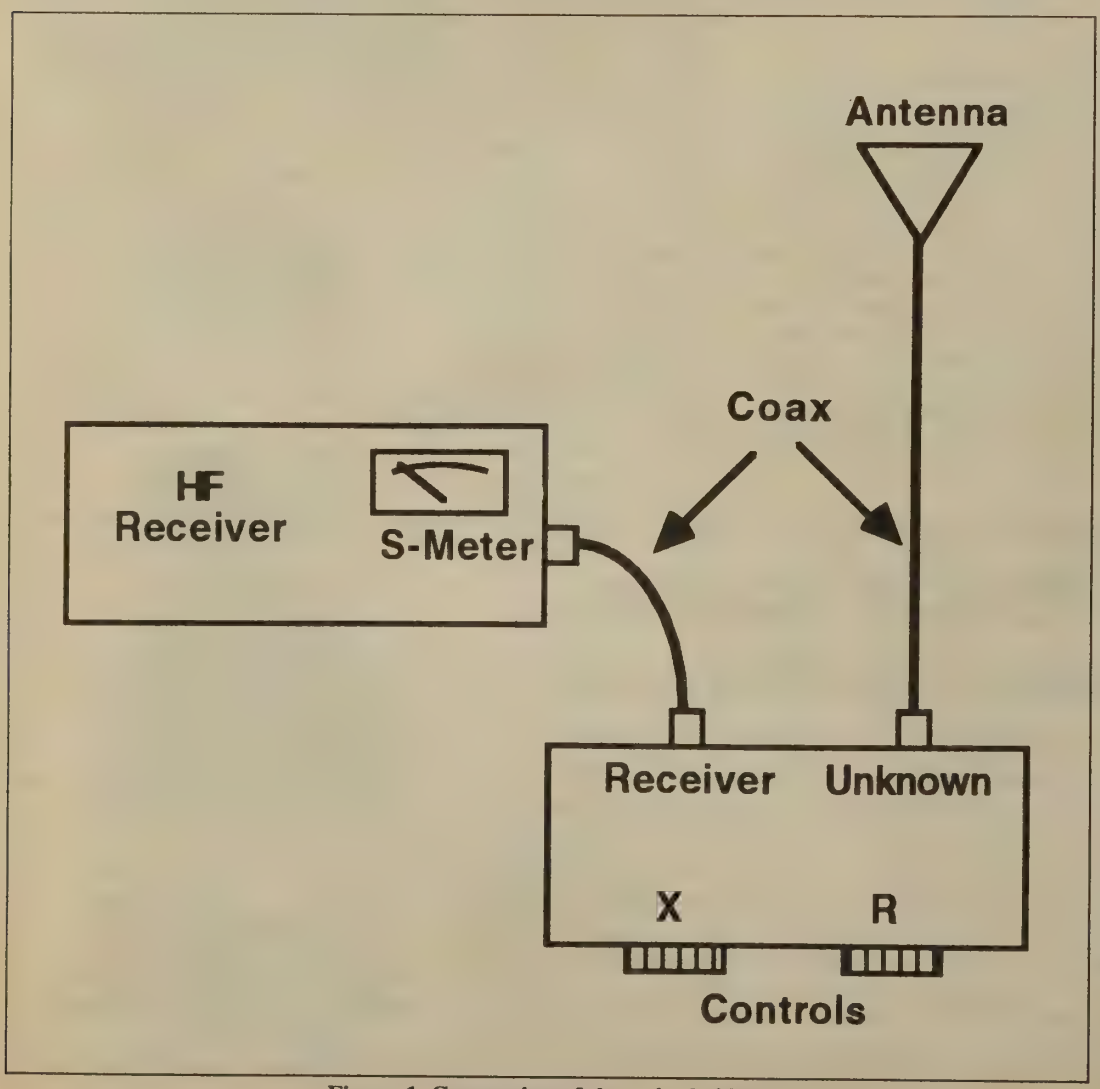


Figure 1. Connection of the noise bridge.

Using the Noise Bridge

Finding Impedance: Set the noise bridge resistance control to the antenna feedline impedance (usually 50 or 75 ohms for most amateur radio HF antennas). Set the reactance control to mid-range (zero). Next, tune the receiver to the expected resonant frequency (F_{exp}) of the antenna. Turn the noise bridge on and look for a noise signal of about S9 (this will vary on different receivers, but if—in the unlikely event that—the antenna is resonant on the expected frequency, it will be a lot lower).

Adjust the Resistance control (R) on the bridge for a null, i.e. minimum noise, as indicated by the S-meter. Next, adjust the Reactance control (C) for a null. Repeat the adjustments of the R and C controls for the deepest possible null, as indicated by the lowest noise output on the S-meter (there is some interaction between the two controls).

A perfectly resonant antenna will have a reactance reading of zero ohms, and a resistance of 50 to 75 ohms. Real antennas may have some reactance (the less the better), and a resistance that is different from 50 or 75 ohms. Impedance matching methods can be used to transform the actual resistive component to the 50- or 75-ohm characteristic impedance of the transmission line.

If the resistance is close to zero, then suspect that there is a short circuit on the transmission line, and an open circuit if the resistance is close to 200 ohms.

A reactance reading on the X_L side of zero indicates that the antenna is too long, while a reading on the X_C side of zero indicates an antenna that is too short.

An antenna that is too long or too short should be adjusted to the correct length. To determine the correct length, we must find the actual resonant frequency, Fr. To do this, reset the Reactance control to zero, and then SLOWLY tune the receiver in the proper direction—downband for too-long and upband for too-short—until the null is found. On a high Q antenna the null is easy to miss if you tune too fast. Don't be surprised if that null is out of band by quite a bit.

Resonant Frequency: Connect the antenna, noise bridge and the receiver in the same manner as above. Set the receiver to the expected resonant frequency: i.e. 468/F for half-wavelength types and 234/F for quarter-wavelength types. Set the resistance control to 50 ohms or 75 ohms, as appropriate for the normal antenna impedance and the transmission line impedance. Set the reactance control to zero. Turn the bridge on and listen for the noise signal.

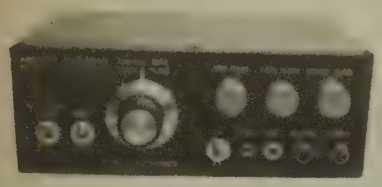
Slowly rock the reactance control back and forth to find on which side of zero the null appears. Once the direction of the null is determined, set the reactance control to zero, and then tune the receiver towards the null direction (downband if null is on X_L side and upband if on the X_C side of zero).

A less than ideal antenna will not have exactly 50 or 75 ohms impedance, so some adjustment of R and C to find the deepest null is in order. You will be surprised how far off some dipoles and other forms of antennas can be if they are not in "free space," i.e. if they are close to the Earth's surface.

There are other uses of the noise bridge, and you can check any of several radio books to see applications. These products are not professional quality impedance bridges, but while they are not pin-point accurate, they are good enough for amateur work in a practical sense. RF

AMATEUR TELEVISION

GET THE ATV BUG



New* 10 Watt Transceiver *Only $499

Made in USA
Value + Quality
from over 25years
in ATV...W6ORG

Snow free line of sight DX is 90 miles - assuming 14 dBd antennas at both ends. 10 Watts in this one box may be all you need for local simplex or repeater ATV. Use any home TV camera or camcorder by plugging the composite video and audio into the front phono jacks. Add 70cm antenna, coax, 13.8 Vdc @ 3 Amps, TV set and you're on the air - it's that easy!

TC70-10 has adjustable >10 Watt p.e.p. with one xtal on 439.25, 434.0 or 426.25 MHz & properly matches RF Concepts 4-110 or Mirage D1010N-ATV for 100 Watts. Hot GaAsfet downconverter varicap tunes whole 420-450 MHz band to your TV ch3. 7.5x7.5x2.7" aluminum box.

Transmitters sold only to licensed amateurs, for legal purposes, verified in the latest Callbook or send copy of new license.

Call or write now for our complete ATV catalog including downconverters, transmitters, linear amps, and antennas for the 400, 900 & 1200 MHz bands.

(818) 447-4565 m-f 8am-5:30pm pst.
P.C. ELECTRONICS
2522 Paxson Lane Arcadia CA 91007

Visa, MC, COD
Tom (W6ORG)
Maryann (WB6YSS)

Basic Packet Radio
By
Joe Kasser, W3/G3ZCZ

Contains 380 pages that describe:-

What packet radio is. What it takes to use it. The Local Area Network (LAN). The Packet Bulletin Board System (PBBS) and how to use it. How to Send and Receive Messages & Bulletins. The distributed LAN. Extending your range via Nodes. PacketClusters. Servers: Dumb and smart. ELMER - The ham's expert system. LAN-LINK manual and evaluation disk.

PRICE $29.95 add $2.00 S & H.

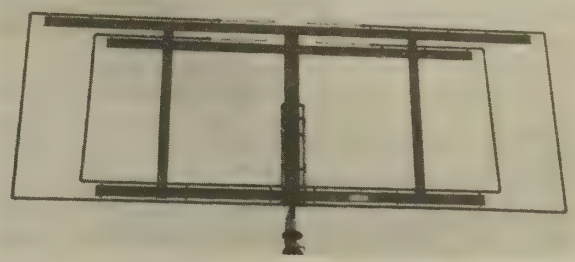
Try it for 30 days. Money cheerfully refunded if you are not satisfied. Send check (US Bank) or money order (state disk size) to:-
Software For Amateur Radio, #200
POB 3419, Silver Spring
MD. 20918
(Overseas, add $6.00 for airmail)

CIRCLE 238 ON READER SERVICE CARD

DX D & D CLIFF DWELLER FIBERGLASS TOWER COMPONENTS

D & D CLIFF DWELLER™

Antennas & Tower Components
P.O. BOX 5114, DOVER N.H. 03820



GORDON BENNETT (KA1STU) of Rochester, New Hampshire says "I love my D & D CLIFF DWELLER two band dipole. I have had it for 24 months and have to date 130 countries confirmed, 50 states confirmed, also 6 continents confirmed. My certificates include DXCC Phone, DXCC 10 meters, WAC and WAS.

I use an ICOM 735 running 75 watts, NO TUNER and NO AMPLIFIER. Also, my dipole operates in a fixed position, NO ROTOR!!

Novice or Advanced I recommend this antenna to all, the D & D CLIFF DWELLER dipole, single or the two band antenna is a fine antenna."

—SEND FOR FREE INFORMATION—

DX D & D CLIFF DWELLER 10 & 15 METER ANTENNAS

PONENTS FOR THE ROHN 25G

CIRCLE 252 ON READER SERVICE CARD

KENWOOD • LARSEN • MFJ • MIRAGE/KLM • RF CONCEPTS • TEN-TEC • YAESU • KENWOOD • LARSEN • MFJ • MIRAGE/KLM • RF CONCEPTS • TEN-TEC • YAESU

Michigan Radio

NEW ADDRESS

SALES *SERVICE*

23040 Schoenherr, Warren, MI 48089
OPEN MON–FRI 10–6, SAT 10–4, SUN CLOSED

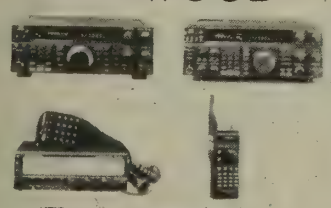
ORDERS	1-800-TRU-HAMM
IN-STATE	1-313-771-4711
SERVICE	1-313-771-4712
FAX SERVICE	1-313-771-6546

Call for our low prices

WANTED: QUALITY USED GEAR, CASH OR TRADE

TERMS:
Prices Do Not Include Shipping.
Price and Availability Subject to Change Without Notice
Most Orders Shipped The Same Day
COD's Welcome ($4.00 + shipping)

KENWOOD



HT'S

MODEL	DESCRIPTION
TH-225A	2M 5W SCANNG DEL
TH-28A	2M 2-5W MICRO 40ME
TH-48A	70CM 2-5W MICRO
TH-78A	2M/70CM DEL DUAL B

MOBILE VHF/UHF

MODEL	DESCRIPTION
TM-241A	2M 45W PROG MIC
TM-331A	220MHZ 25W PROG MIC
TM-441A	440MHZ 25W PROG MIC
TM-741A	2M/70CM/7 TRIBANDER
TH-641A	2M 25W ALL-MODE
TS-790A	2M/70CM SATELLITE

HF EQUIPMENT

MODEL	DESCRIPTION
TS-140S	HF COMP GEN COV
TS-690S	HF/6M COMP GEN COV
TS-450S	HF DELUXE COMP
TS-450S/AT	HFDEL COMP TUNR
TS-850S	HF 12V DEL DDS
TS-850/AT	HF 12V DEL TUNR
TS-950SDX	HF THE DX MACHINE!

KENWOOD

ICOM

HT'S

MODEL	DESCRIPTION
IC-02AT	2M 5W 10MEM DTMF
IC-2GAT	2M 7W 15MEM DTMF
IC-2SAT	2M 2-5W DEL MICRO
IC-2SRA	2M/SCANNER HT
IC-24AT	2M/70CM DEL MICRO
IC-3SAT	220M 2-5W MICRO
IC-4SAT	70CM 2-5W MICRO
IC-4SRA	70CM/SCANNER HT
IC-4GAT	70CM 7W 15MEM DTMF
IC-W2A	2M/70CM DUAL MICRO

MOBILE VHF/UHF

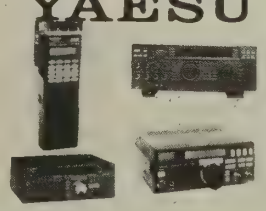
MODEL	DESCRIPTION
IC-229A	2M FM, 25W 20MEM
IC-229H	2M FM, 45W 20MEM
IC-3220H	2M/70CM 25W 40MEM
IC-3220H	2M/70CM 45W 40MEM
IC-2410	2M/70CM 45W DEL.

HF EQUIPMENT

MODEL	DESCRIPTION
IC-728	HF COMPACT GEN COV
IC-729	HF/6M COMP GEN COV
IC-735	HF DELUXE COMPACT
IC-751A	HF 12V BASE TXCR
IC-765	HF DELUXE TNR,PS
IC-781	HF DX'ERS DELIGHT

WE STOCK A FULL LINE OF ACCESSORIES FOR THE ICOM LINES, CALL FOR OUR DISCOUNTED PRICES
1-800-TRU-HAMM

YAESU



HT'S

MODEL	DESCRIPTION
FT-411E	2M 2-5W 50MEM,CTCSS
FT-811	70CM 2-5W 50MEM
FT-470	2M/70CM 2-5W 50MEM
FT-26	2M-5W WITH/DTMS PAGING
FT-76	440MHz-5W WITH/DTMS PAGING
FT-416	2M 5W HT TXCR
FT-815	440 MHz 5W HT TXCR
FT-212RH	50W 2M COMPACT MOBILE

MOBILE VHF/UHF

MODEL	DESCRIPTION
FT-290RII	2M 25W ALL-MODE
FT-690RII	6M 10W ALL-MODE
FT-736R	2M/70CM 220/1.2 SAT
FT-5200	2M/70CM DUAL BAND
FT-8200	70CM/1.2 DUAL BAND
FT-2400H	2M 50W,LCD,CTCSS
FT-790RII	70CM 25W ALL-MODE

HF EQUIPMENT

MODEL	DESCRIPTION
FT-747GX	HF LGTWGT MOBILE
FT757GXII	HF COMP GEN COV
FT-767GX	HF 2/220//70C TUNR
FT-990	HF 12V DEL TUNR +
FT-1000B	HF BASIC VERSION
FT-1000D	HF QSL CATCHER!!
FT-890AT	HF DEL MOBILE DOS

YAESU

DIAMOND ANTENNA

MODEL	DESCRIPTION
NR-770H	2M/70CM 3/5 DB MOB ANT
NR-770R	2M/70CM 3/5.5 DB MOB
SX-100	100 M 1.6–60M 30/300/3kW
SX-1000	1000 M 1 8–160/-1300
SX-200	200 M 1 8–200M 5/20/200W
SX-400	400 M 140–525M 5/20/200W
SX-600	600 M 1.8–60/140–525 200W
X-200A	2M/70CM 8.3 H 6/8 DB
X-300	2M/70CM 6.5/9 DB
X-500A(N)	2M/70 8.3/11.7 DB
X-500HNA	HD REPEATER VER X-500
X-50A	2M/70CM 5 6'H 4.5/7.2 DB
X-700	2M/70CM 24'H 9.3/13 DB

KANTRONICS

MODEL	DESCRIPTION
DATA ENGINEER	TNC SOFTWARE
KAM	CW/RTTY/PACKET/FAX TNC
KPC-2	300/1200 BAUD PACKET TNC
KPC-2400	300/1200/2400 TNC
KPC-4	DUAL PORT VHF PACKET TNC

DAIWA

MODEL	DESCRIPTION
CN101	METER 1.8–150 MHz 15/1.5K
CN103	140–525 MHz SWR/PWR METER
CN410M	3.5–150 MHz SWR/PWR MTR
CN460M	140–450 MHz SWR/PWR MTR
CN465	METER 140–450 MHz 15/75W
CN520	METER 1 8–60 MHz 200/2kW
NS660A	METER 1.8–150 MHz 30/3kW
NS660PA	METER 1 8–150 MHz 3kW
NS663BM	SWR METER BASE UNIT
NS663BN	METER 150–525 MHz 300W

cushcraft CORPORATION

MODEL	DESCRIPTION
A3S	ANT HF 10/15/20M 3 EL STAI
A3WS	ANT HF 12/17M, 3 EL, 8DB, STAI
A4S	ANT HF TRIBANDER 10/15/20
AP8	ANT HF 80–10 WARC VERTICAL
AR-10	TEN METER RINGO
AR-2/70	2M/70CM BASE VERTICAL
ARX-220B	220 MHz VERTICAL
ARX-2B	VHF 2M VERTICAL
AV3	HF 20/15/10M VERTICAL
AV5	ANT HF 80/40/20/15/10 VERTICAL
R5	HF 20/17/15/12/10 VERTICAL
R7	7, 10, 14, 18, 21, 24, 28M VERTICAL

hconcepts

MODEL	DESCRIPTION
2-117	144MHz AMP10WIN 170WOUT
2-217	144MHz AMP 2WIN 170WOUT
2-23	144MHz AMP 2WIN 30WOUT
2-317	144MHz AMP 30WIN 170WOUT
2-417	144MHz AMP 45WIN 170WOUT
2/70	DUAL 3–30W 2M/5–20W 440
2/70G	PREA 3–30W 2M/5–20W 440
3-112	220MHz 10WIN 120WOUT
3-211	220MHz 2WIN 110WOUT
3-22	220MHz AMP 2WIN 20WOUT
3-312	220MHz 30WIN 120WOUT
4-110	440MHz AMP 10WIN 100WOUT
4-310	440MHz AMP 30WIN 100WOUT
4-32	440MHz AMP 3WIN 20WOUT
RFC-2/70	DUALBAND AMP 5WIN 25WOUT

AEA ADVANCED ELECTRONIC APPLICATIONS

MODEL	DESCRIPTION
ISOLOOP	14–30MHz HF ANTENNA
ISOPOLE144	2M BASE VERTICAL
MM-3	TRAINER/KEYER
PCB-86	IBM COMP PLUG-IN BRD
PK 232MBX	ALL-MODE RTTY, CW
PK-88	PACKET TNC 300/1200 BAND

ASTRON CORP.

MODEL	DESCRIPTION
RM-35M	POWSUP 19" RACK 25, 35AC
RM-50M	POWSUP 19" RACK 35, 50AC
RS-12A	POWSUP 12V, 9A CONT 12SUR
RS-12M	12V, 9 C 12S W METERS
RS-12S	POWSUP 12V 7.5 10C SPKR
RS-20A	POWSUP 12V, 16 CON 20 SUR
RS-20M	POWSUP 12V 16C 20S W MET
RS-20S	POWSUP 12V 16, 20C SPKR
RS-35A	POWSUP 12V, 25 CON 35 SUR
RS-35M	POWSUP 12V, 25C, 35S W MTR
RS-50A	POWSUP 12V, 35 CON 50 SUR
RS-50M	POWSUP 12V, 35C 50S W MET
RS-7A	POWSUP 12V 5A CON 7A SUR
VS-20M	16A, 20C MTR VOL/CUR CON
VS-35M	POWSUP 12V25C 35S MET VA
VS-50M	POWSUP 12V35C 50S MET VA

KENWOOD • LARSEN • MFJ • MIRAGE/KLM • RF CONCEPTS • TEN-TEC • YAESU • KENWOOD • LARSEN • MFJ • MIRAGE/KLM • RF CONCEPTS • TEN-TEC • YAESU

• B & W • BENCHER • BUTTERNUT • CUSHCRAFT • • HYGAIN • ICOM • KANTRONICS •

AEA • KENWOOD • ASTRON • ALPHA-DELTA • AMERITRON • ANTENNA SPEC • AEA • KENWOOD • ASTRON • ALPHA-DELTA • AMERITRON • ANTENNA SPEC

CIRCLE 162 ON READER SERVICE CARD

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

JAN 4

CHATTANOOGA, TN WCARS/VEC Exams will be held at Walker County (GA) Civic Center, US Hwy 27, Rock Springs, GA, at 7 PM. Contact *Alan Painter WA4QCH, 234 Wallaceville Rd., Rossville GA 30741; Tel. (404) 866-1200.* Alternate Contact: *Dale Harwood N4VFF, Rt.4 Box 297-B Hwy. 41 N, Ringgold GA 30732; Tel. (404) 937-5680.* Walk-ins normally accepted.

JAN 9

AUGUSTA, GA VE Exams will be sponsored by Western Carolina ARS/VEC at Daniel Fields Airport General Aviation Office. Code tests at 10 AM, written elements at 11 AM. Contact *Jim Abercrombie N4JA, 2360 Travis Pines Rd., Augusta GA 30906; Tel. (404) 790-7802.* Walk-ins normally accepted.

GREENVILLE, SC WCARS/VEC Exams will be held at 8:30 AM at O'Neal Engineering Bldg., 850 S. Pleasantburg Dr. Contact *John E. Chism ND4N, 203 Lanewood Dr., Greenville SC 29607; Tel. (803) 288-0136.* Walk-ins normally accepted.

MIDDLESBORO, KY WCARS/VEC sponsored VE Exams will be held at 10 AM at the Middlesboro City Library. Contact *Andrew A. Pitt WB8WEZ, P.O. Box 2164, Middlesboro KY 40965; Tel. (606) 248-0046.* Alternate Contact: *James E. Dyke KZ8A, RR 1 Box 295 AA, Cumberland Gap TN 37724; Tel. (615) 869-4453.* Walk-ins normally accepted.

MORRISTOWN, TN WCARS/VEC Exams will be held at 7:30 PM at the Red Cross Bldg. Contact *Roy Zeigler KF4CB, 2261 Warren Dr., Morristown TN 37814.* Alternate Contact: *D.C. Gluck WD4FOX, P.O. Box 335, Talbott TN 37877; Tel. (615) 586-2041.*

WEST MEMPHIS, AR The WCARS/VEC will conduct VE Exams at the Rosewood United Methodist Church, 2303 E. Barton Ave., at 9 AM. Contact *Gene Bagley AB5BL, Rt.1 - Box 13, Dunhill Rd. N, Marion AR 72364; Tel. (501) 739-4029.* Alternate Contact: *Rev. Richard Gregory AB5CH, 824 Pryor Dr., West Memphis AR 72301; Tel. (501) 735-4060.* Walk-ins normally accepted.

JAN 10

JASPER, TN WCARS/VEC Exams will be held at the Jasper Public Library at 1 PM. Pre-registration preferred. Mail Form 610, copy of any license, copy of any CSCE, and check for exam fee (made payable to WCARS/VEC) to contact person. If no one pre-registers, the session will be cancelled. Contact *Charles Wooten KD4XX, 103 W. 7th St., Jasper TN 37347; Tel. (615) 942-5116.* Alternate Contact: *Wallace S. Brown KD4XV, 409 Magnolia Ave., Jasper TN 37347; Tel. (615) 942-2836.*

JAN 11

ATHENS, TN WCARS/VEC Exams will be held at 8 PM at the Athens Municipal Building, Council Chambers. Contact *Evan Ray WA4PNI, 529 N. Washington Ave., Etowah TN 37331; Tel. (615) 263-9300.* Walk-ins normally accepted.

JAN 16

CAMERON, MO The Missouri Valley ARC, Green-Hills ARC, and Ray-Clay ARC, will co-sponsor the 3rd annual Northwest Missouri Winter Hamfest from 9 AM-4 PM at the KMRN Tri-Rivers Expo Hall on US 69, one mile north of I-35 exit 48 (Wallace State Park exit). FCC Exams. Indoor Flea Market. Free Parking. Tickets $2 in advance or 3/$5; $3 at the door or 2/$5. Pre-registration requests received after Jan. 4th, 1993, will be held at the door. Swap tables $9 ea. for the first two tables. Commercial exhibitors welcome; write for details. Talk-in on 146.52 and 446.00 simplex. Contact *Northwest Missouri Winter Hamfest, P.O. Box 182, Cameron MO 64429.*

CHARLESTON, SC WCARS/VEC Exams will be held at Trident Technical College at 9 AM. Contact *Pat Foster AC4IH, 117 Keenan Ave., Goose Creek SC 29445; Tel. (803) 553-3871.* Alternate Contact: *Werner E. Dolder AA4IX, 327 Heber Rd., Summerville SC 29483; Tel. (803) 873-9465.* Walk-ins normally accepted.

HAMMOND, LA The Southeast Louisiana ARC will sponsor the 1993 Hammond Hamfest, to be held in the SLU University Center from 9 AM-4 PM. Free admission. VE Exams. ARRL and QCWA Meetings. Free Swap Tables (limited number). Commercial vendors may setup Fri. afternoon. Contact *Ernest Bush N5NIB, 331 Rock Rd., Hammond LA 70403; Tel. (504) 567-1261 (days); (504) 542-0034 (eves.).*

KNOXVILLE, TN VE Exams, for Upgrades only, will be held at Pellissippi State Technical Community College, Room B-129 (formerly STIK, Pellissippi Campus). Code tests at 10 AM,
10:20 AM and 10:40 AM. All written elements at 11 AM. Pre-registration requested. Send Form 610, copy of license and any CSCE, and a check for the exam fee (payable to WCARS/VEC) to be received by the day before the test. Registrations will be accepted in the exam room until 9:30 AM - none later. Contact *Ray Adams N4BAQ, 4325 Felty Dr., Knoxville TN 37918; Tel. (615) 688-7771.* Alternate Contact: *Rich Slover ND4F, P.O. Box 30754, Knoxville TN 37930; Tel. (615) 539-4821.* Novice testing on request from N4BAQ, ND4F, WA4GZE, N4IJL, W4MHA, WA4TKN and others.

LOUISVILLE, KY VE Exams will be held 10 AM-2 PM at the Government Center, Outer Loop 3 mi E I-65. Walk-ins only. Contact *Otis Herron AA4HJ, 4810 Hood Rd., Louisville KY 40213; Tel. (502) 969-7332.* Alternate Contact: *Bob Happel N4LGX, 2012 Ben Ali Rd., Louisville KY 40223; Tel. (502) 425-5260.*

MONTEREY, CA The Naval Postgraduate School ARC will sponsor their 4th annual NPSARC Winterfest at Monterey Peninsula College Armory, from 8 AM-1 PM+, rain or shine. Free admission. Commercial vendors. Indoor Flea Market, $10 per space. Demonstrations. Outdoor Tailgate Market, $5 per space. Talk-in on 146.97-. Contact *Doug KC3RL, 9 Glenn Ave., Prunedale CA 93907; Tel. (408) 663-6117.* Or call *Pat KA6IRS, (408) 649-4444 ext. 20 (days only).*

SPINDALE, NC WCARS/VEC Exams will be held at 10 AM at Isothermal College. Contact *A.B. Brackett KO4BJ, Rt. 2 Box 242, Bostic NC 28018; Tel. (704) 245-6334.* Alternate Contact: *F. Bruce Tessinear KD4OJ, P.O. Box 341, Henrietta NC 28076; Tel. (704) 657-5464.*

JAN 17

SOUTHFIELD, MI The Southfield High School ARC will sponsor their 27th annual Hamfest/Electronics/Computer Swap & Shop at Southfield High School, 24675 Lahser, Southfield MI 48034. Doors open at 6 AM for exhibitors. Open to the public 8 AM-3 PM. Admission is $4 (children 12 and under free). Reserved tables are $15 for each 8' table (reserved and paid in advance). Table rental does not constitute admission. For info, write or call: or send check (made out to Southfield High School) for tables and tickets. Indicate if you need electricity, and also please indicate the kind of material you have for sale. Contact: *Robert Younker, Southfield Senior High School, 24675 Lahser Rd., Southfield MI 48034.* Answering machine: *(313) 746-8675.* Office Phone: *(313) 746-8675.* FAX: *(313) 746-8664.* Long distance replies will be made collect. Table reservations are on a first-come, first-served basis.

SUMTER, SC WCARS/VEC Exams will be held at 8:30 AM at Abundant Faith Church. Contact *Dan Mask WB5SGH, 404 Sanders Dr., Sumter SC 29150; Tel. (803) 775-9106.* Walk-ins normally accepted.

YONKERS, NY There will be a Giant Electronic Fleamarket at the Lincoln High School, Kneeland Ave., off Yonkers Ave., from 9 AM-3 PM, rain or shine. Free Parking. Admission $4, kids under 12 free. Indoor Flea Market only. Set-up at 7 AM. No tailgating! VE Exams. Sellers: $15 1st table, $10 ea. add'l. table. All tables 30" x 5'; or bring your own table at $1.80 per ft.—min. $10. Full payment due with registration by Jan. 10th. No paid reservations for tables or space will be held past 9 AM. No refunds unless notification of cancellation has been received 72 hours in advance of the event. Tables $20 at the door, or $2.50 per ft. For registration: *Otto Supliski WB2SLQ, (914) 969-1053.* Mail paid reservations to: *Metro 70 cm. Network, 53 Hayward St., Yonkers NY 10704.* Talk-in on 440.425 MHz PL 156.7, 223.760 MHz PL 67.0, 146.910 MHz, 443.350 MHz PL 156.7.

JAN 18

JAMESTOWN, TN WCARS/VEC Exams will be held at the First Baptist Church at 7 PM. Contact *Mike Ledbetter AB4BX, Rt. 4 Box 759, Jamestown TN 38556; Tel. (615) 879-8626.* Alternate Contact: *Fred Davis K8DOC, 17 Sleepy Hollow, Jamestown TN 38556; Tel. (615) 879-9268.* Walk-ins normally accepted.

JAN 22

ELIZABETHTON, TN WCARS/VEC Exams will be held at Moody Aviation - Carter County Airport at 7 PM. Applicants must be pre-registered the day before the test session. Contact *Joe Hopkins KA4BKI, 414 East H. St., Elizabethton TN 37643; Tel. (615) 543-4022.* Alternate Contact: *Jon Christiansen AB4NN, Echo Dr., Elizabethton TN 37643; Tel. (615) 543-7155.*

JAN 23

ASHEVILLE, NC WCARS/VEC Exams will be held at 9 AM at the Health and Social Services Bldg. Contact *Norman G. Harrill N4NH, 7 Skylyn Ct., Asheville NC 28806; Tel. (704) 253-1192.* Walk-ins normally accepted.

CRYSTAL RIVER, FL The 13th Annual Citrus County Hamfest/Computer Show, sponsored by the Sky High ARC, will be held at the National Guard Armory located on Seven Rivers Dr., just south of the Crystal River Airport off route US19. Starts at 8:30 AM. All items to be 80% HAM related. Free Parking. Tailgating. Self contained RV parking. Set-up from 3 PM-5 PM Fri., and 7 AM-8:30 AM Sat. 120V AC available at no charge (users must provide plugs, cords, and tape where cords cross aisles). Admission $4 until Jan. 9th, then $5 thereafter. XYL's free with OM. All exhibitors and helpers *must* purchase admission tickets. Indoor tables $15, chair provided. Outdoor spaces $8 (does not include tables, chairs or power). All tables are 30" x 8'. Telephone reservations 10 AM-9 PM only. Payment must be received within 7 days or reservation will be cancelled. Confirmation mailed on receipt of payment and SASE. Talk-in on 146.355/.955. Call *Billy WE4C, (904) 726-2905, 10 AM-9 PM.* Write: *SHARC Hamfest, 8811 Maplewood, Iverness FL 34450.*

GALLATIN, TN VE Exams will be held at 11 AM at the Red Cross Bldg., S. Water Ave. By Pre-registration only. Contact *Ronnie L. Gilley KA4LUG, 512 Hillside Ln., Gallatin TN 37066; Tel. (615) 452-0883.* Alternate Contact: *Jerry Goodchild K4DZR, 233 Sterling Rd., Hendersonville TN 37075; Tel. (615) 824-7699.*

GREENEVILLE, TN WCARS/VEC Exams will be held at Roby Adult Center, 203 N. College St. at 10 AM. Contact *Jack Creed K4EPC, 826 Redbud Dr., Greeneville TN 37743; Tel. (615) 638-7056.* Walk-ins normally accepted.

MEMPHIS, TN VE Exams will the held at 9 AM at Central Church, 6655 Winchester Rd. Contact *Win Guin W2GLJ, 2138 Sonning Dr., Germantown TN 38138; Tel. (901) 754-4552.* Alternate Contact: *Nita Wofford N4DON, 2966 Cordell St., Memphis TN 38118; Tel. (901) 363-4971.* Walk-ins normally accepted.

NEW BERN, NC VE Exams for Walk-ins only, will be held at 9 AM at New Bern High School. Contact *Andy Griffith W4ULD, 203 Lord Granville Dr., Rt. 2, Morehead City NC 28857; Tel. (919) 726-5924.* Sponsored by WCARS/VEC.

JAN 23-24

GALLATIN, TN The Tennessee Valley AR Network will hold its 3rd annual Middle Tennessee Hamfest/Packet Conference at the National Guard Armory on Hwy. 25 East. Set-up Fri. Noon to 6 PM; Sat. 5 AM-8 AM. Open Sat. 8 AM-4 PM, Sun. 8 AM-2 PM. Admission $5 each day; XYLs and under 16 FREE. Tables $10 for both days (includes 1 admission). VE Exams. Register Sat. 9 AM-11 AM. Pre-registration guarantees exam. Testing begins at 11 AM. Packet forums both days. Talk-in on 145.13-, 147.30+ and 442.600+, starting at 10 AM Fri, 5 AM Sat., 7 AM Sun. Contact *Bill Ferrell, (615) 452-3962 after 5 PM M-F, anytime S-S;* or write *TVARN, 1120 Douglas Bd. Rd., Gallatin TN 37066.*

JAN 31

DOVER, OH The TUSCO ARC Hamfest will be held at the Ohio National Guard Armory, 2800 N. Wooster Ave., starting at 8 AM. Set-up at 6 AM. Admission Free. Tables $8 ea. Talk-in on 146.730 W8ZX rptr. Contact *Howard Blind KD8KF, 6288 Echo Lake Rd. N.E., New Philadelphia OH 44663; Tel. (216) 364-5258.*

WHEATON, IL The Wheaton Community Radio Amateurs Mid-Winter Hamfest will be held at the Odeum Expo Center, Villa Park, IL, starting at 8 AM. EZ access from major X-ways. NOW VEC Testing. Flea Market and Commercial tables available on reserved basis. Free and paid parking. Handicap access. Women's programs. Free shuttle bus. Seminars and more. Tickets $5 in advance w/3 drawing stubs; $6 at the door w/1 stub. Talk-in on 14.390. Contact *Wheaton Community Radio Amateurs, P.O. Box QSL, Wheaton IL 60189.* For info call *(708) 629-8006* or *(708) 629-8889.*

FEB 6

KNOXVILLE, TN The Shriners of the Kerbela ARS, Kerbela Shrine Temple, will sponsor KERBELA HAMFEST (was Sevierville) at the Kerbela Temple from 8 AM-4 PM. Admission $2. Tailgating $3 plus admission. Tables $8. Set-up 4 PM-9 PM Fri., and 5 AM-8 AM Sat. Talk-in on 146.34/.94. For table info, contact *Paul Baird KY4A, 1500 Coulter Shoales Circle, Lenoir City TN 37771; Tel. (615) 986-9562).* FCC Exams by WCARS-VEC. Pre-Registrations until 9:30. Code test begins at 10 AM. Written test follows at 11 AM. Mail completed Form 610 with check for $5.40 (payable to WCARS/VEC) to *Ray Adams N4BAQ, 5833 Clinton Hwy., Suite 203, Knoxville TN 37912-2545. Tel. (615) 688-7771).*

LANCASTER, PA A Dutch Country Computer and Communications Show will be held at the Lancaster Host Golf Resort and Conference Center on US Route 30 east. Sponsored by the Columbia Area ARC, Inc. For info, contact *CAARC, P.O. Box 574, Columbia PA 17512; Tel. (717) 627-1597.* For Vendor info, *Fax (717) 872-0857.*

FEB 27

LaPORTE, IN The LaPorte ARC will host a Hamfest at the LaPorte Civic Auditorium, 1001 Ridge St., beginning at 8 AM. Set-up at 6 AM. Admission $4 at the door (no advance). Tables, $5 prepaid. Send payment, with SASE to *LPARC, P.O. Box 30, LaPorte IN 46350.* Talk-in on 146.610.

SPECIAL EVENT STATIONS

JAN 15-18

WASHINGTON, DC MADRAS, the Maryland Apple Dumpling ARS, Inc. will operate W3USS at the Russell Senate Office Bldg. on Capitol Hill, to commemorate the inauguration of the 42nd President of the United States, Bill Clinton and Vice President Albert Gore. Operation will be from 2300Z Fri., Jan. 15th, to 2300Z Mon., Jan. 18th. Frequencies: Phone—1.855, 3.905, 7.205, 14.270, 21.345, 28.490 MHz; CW—1.810, 3.640, 7.050, 14.050, 21.050, 28.050 MHz. Each evening, the Station will operate CW in the bottom of the Novice bands; 80m 7 PM-8 PM, 40m 10 PM-11 PM E.S.T. The operator will adjust his code speed to that of the calling station. For certificate send 9 x 12 SASE to *Box 2468, Wheaton MD 20902, U.S.A. Visitors to the Virginia, DC and Maryland area needing help or info, contact* MADRAS 145.45, 444.1 or 146.505 simplex.

JAN 23

AUBURN, NY The Auburn ARA will operate KC2VB from 1500Z-2100Z to celebrate the bicentennial of the founding of Auburn and Winterfest. Operation will be in the lower 25 MHz of the General 40, 20, 15, and 10m bands, and the corresponding Novice bands. For a certificate, send a 9 x 12 SASE to *Stan Gutelius KC2VB, 4 Elizabeth St., Auburn NY 13021.*

JAN 23-24

EVANSTON, WY The Uinta County ARC will operate NW7H 1500Z-2400Z, to celebrate the Chinese New Year. Phone 10X on 28.395, 24.945, 21.325, 18.140, 14.245, or CW on 7.122. For a certificate, send your QSL with 9 x 12 inch SASE to *Vranish, P.O. Box 2048, Evanston WY 82931-2048.*

JAN 28

SAN DIEGO, CA The Challenger Junior High School ARC will operate KI6YG from 1500Z-2400Z, to commemorate the Challenger Space Shuttle tragedy that occurred on this date seven years ago. Frequencies: 14.270, 21.270, and 28.270. For a special QSL card, please send your QSL and SASE to *Frank Forrester KI6YG, Challenger JHS ARC, 10810 Parkdale Ave., San Diego CA 92126.*

FEB 5-6

VERMONT The Central Vermont ARC (W1BD) and The Burlington ARC (W1KOO) will be multipliers for the 30th Annual Vermont QSO Party. All licensed amateur radio operators are invited to participate. Frequencies: Phone—160-10m. First 25 kHz up from the beginning of General phone band privileges and Novice phone 10m privileges. CW—40 kHz up from the bottom edge of the bands and 20 kHz up from bottom of Novice portions. VHF—50.200, 144.200, and 146.49 MHz. Other modes in the customary section of the respective band. Repeater contacts not allowed. Exchange: VT stations send RS(T) and County. CW two-letter designator as follows—AD, BN, CL, CH, ES, FR, GI, LM, OG, OL, RT, WA, WM, WR. Other stations send RS(T), state, province, or DXCC country. Scoring: VT stations count 1 point per phone contact, 2 points for CW, digital, ATV, etc. Multiply by number of VT counties, states/provinces/countries, W1BD and/or W1KOO QSOs. Other stations count 1 point per VT phone contact; 2 points per VT CW, digital, or ATV contact. Multiply by number of VT counties and W1BD and/or W1KOO QSOs. A station may be worked twice per band: one phone contact and one other type mode per band. Awards: VT stations submitting a log will receive a Special Certificate. Plaques will be awarded to the 3 highest scoring VT stations. Other stations receive a Special Certificate for highest scoring station in each state/province/country. The WVT Award is given to stations working 13 or Vermont's 14 counties. Send logs/facsimilies, name, address, call, whether single or multioperator, postmarked no later than March 1, 1993 to: *Bob DeForge K1HKI, RR1 Box 271, Brookfield VT 05036.* Please send SASE for results.

1 - 800 - 4 - A - HAM - TV

(ORDERS ONLY PLEASE)

*** DUAL RX ! ***

SINGLE BAND TRANSCIEVER $399.95

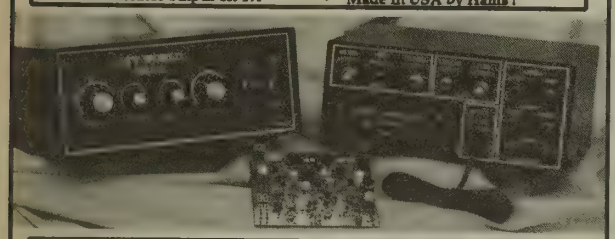
RX 420-450 Mhz TV Ch 3/4 Output
– OR –
RX on 1.2 Ghz TV Ch 7/8 Output
– OR –
RX on 900 MHz TV Ch 2/3 Output
– BOTH –
TX 420-450 Mhz 10 W. 4 Channel
Video Monitor output on TX

Simple Front Panel Layout
Connectors all on Rear Panel
May Upgrade to Dual RX
High Grade Cabinet
Individual RX TV Outputs
Spare Set A/V Jacks on Rear

DUAL BAND RX TRANSCIEVER $489.95

RX 420-450 Mhz TV Ch 3/4 Output
RX on 1.2 GHz or 900 MHz while Tx
TX 420-450 Mhz 10 W. 4 Channel
Video Monitor output on TX

High Quality G-10 Ckt Brds
Solder Mask and Silk Screen
Drive Amps to Full Output
Made in USA by Hams !



BOARD LEVEL PRODUCTS		PRODUCTS in DEVELOPMENT	
Cabinet Bare Silk Screened	$99.95	FM and AM Video/Audio IF System	$99.95
Cabinet with All Hardware	$79.95	900 Mhz Transmitter 4 Ch. 2-3 Watt	$199.95
TX 4 Channel 10 Watt	$159.95	1.2 GHz Transmitter 4 Ch. 2-3 Watt	$199.95
1.2 Ghz, 900 MHz or 430 Mhz RX	$99.95	50 Watt Liner Amplifier 430 MHz	$299.95

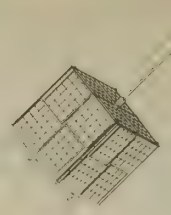
ATV WORLD
PHOENIX ARIZONA
A STEP ABOVE DEAD AIR

TECHNICAL LINE
(602) 978-4348
ORDER LINE
(800) - 4 - A - HAM - TV
(800) 424-2688

3713 W. CHARLESTON AVE GLENDALE, ARIZONA 85308

CIRCLE 17 ON READER SERVICE CARD

AMSAT



Dedicated to Keeping Amateur Radio in Space!

AMSAT — *The Radio Amateur Satellite Corporation* is an organization of Radio Amateurs who design, build and launch satellites for use by Radio Amateurs around the world.

Your new Amateur Radio License will be your ticket to a whole world of exciting opportunities. Why not expand your horizons even further by becoming a member of AMSAT and participating in space aged Amateur Radio?

Join the Excitement! Join the Fun! Join AMSAT!

Yearly Membership dues: $30 U.S., $36 Canada/Mexico, $45 Elsewhere JOIN NOW!

Name_____ Call_____

Address_____

City_____ State_____ Zip_____

$15 of membership dues goes toward a subscription to *The AMSAT Journal*

Post Office Box 27, Washington, DC 20044
Telephone 301-589-6062 Fax 301-608-3410

CIRCLE 110 ON READER SERVICE CARD

IT'S NOT WORTH THE WEIGHT.

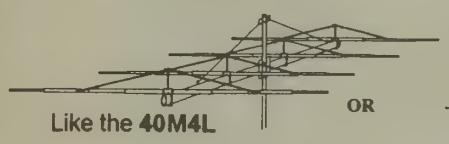
For better health and fitness, exercise.

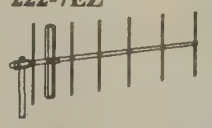
American Heart Association

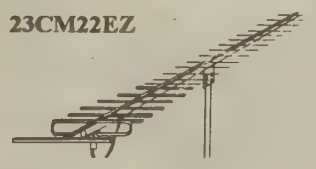
© 1992, American Heart Association

M2 Has Antennas for the future

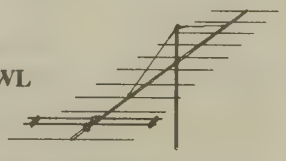
SURE M² *Has a lot of innovative* NEW ANTENNAS!!

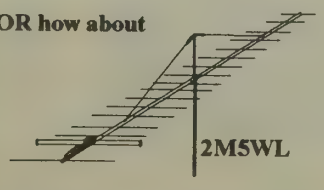


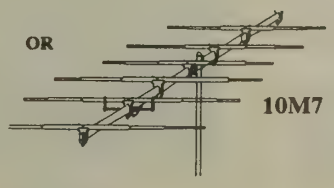


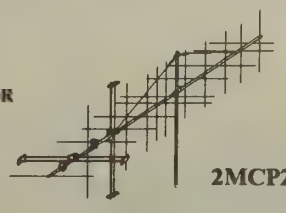


BUT DON'T FORGET THE GREAT ONES THAT STILL BREATH FIRE ON THE BANDS!







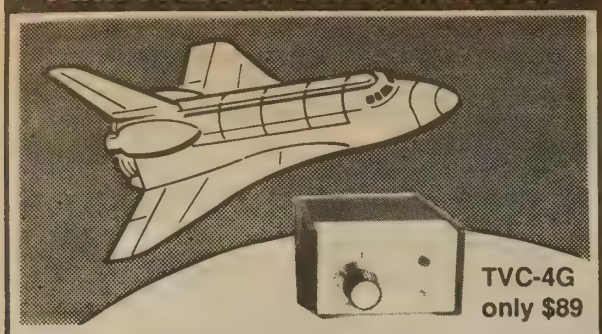


And remember we can help with the phasing harnesses, power dividers, H frames and of course AZ and EL rotators!

M² Enterprises 7560 N. Del Mar Fresno, CA 93711 (209) 432-8873 FAX (209) 432-3059

CIRCLE 274 ON READER SERVICE CARD

AMATEUR TELEVISION



TVC-4G only $89

SEE THE SPACE SHUTTLE VIDEO

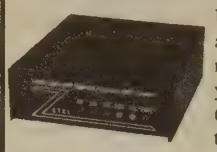
Many ATV repeaters and individuals are retransmitting Space Shuttle Video & Audio from their TVRO's tuned to Satcom F2-R transponder 13. Others may be retransmitting weather radar during significant storms. If it is being done in your area on 70 CM - check page 413 in the 91-92 ARRL Repeater Directory or call us, ATV repeaters are springing up all over - all you need is one of the TVC-4G ATV 420-450 MHz downconveters, add any TV set to ch 2, 3 or 4 and a 70 CM antenna. We also have downconverters and antennas for the 900 and 1200 MHz amateur bands. In fact we are your one stop for all your ATV needs and info. Hams, call for our complete ATV catalog - antennas, transceivers, amplifiers. We ship most items within 24 hours after you call.

(818) 447-4565 m-f 8am-5:30pm pst. Visa, MC, COD
P.C. ELECTRONICS Tom (W6ORG)
2522-WG Paxson Ln Arcadia CA 91007 Maryann (WB6YSS)

Transceiver Control
Computer Interface

Control **Kenwood, Icom, Yaesu**, Ten-Tec and other transceivers. The low power microminiature electronics is built into the DB-25 connector. Power is borrowed from the computer, so there is **no power supply** to pick up RFI. No assembly required. Compatible with **Ham Windows, CT, DXBase, LOGic**, and all other rig control software. **Specify your transceiver make and model number:** we will wire the correct connector for you. Cable and RC-Plus software: **$54.95** ($5 s/h)

Make and Receive Phone Calls on your own Personal Autopatch!



Use any phone line and an HT or base station to make phone calls from your car. **Full duplex** (both parties can talk at the same time) or **simplex** (VOX with turn-around beeps). Programmable local and long distance **access codes**. Regenerated DTMF / Pulse dialing. **Automatic CW identification**.
1.5"Hx4.6"Wx5.1"D RF shielded metal enclosure.
Autopatch $199.95 ($5 s/h) **12V adapter $11.95**

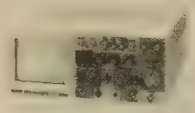
Foreign Orders add $10.
CA orders add Sales Tax.
Money back guarantee.

j-Com Box 194T Ben Lomond CA 95005
(408) 335-9120 FAX 335-9121

CIRCLE 55 ON READER SERVICE CARD

48 HOUR SHIPPING
ELENCO & HITACHI & B+K PRODUCTS AT DISCOUNT PRICES
TO ORDER CALL TOLL FREE 1-800-292-7711 1-800-445-3201 (Can.)

ELENCO OSCILLOSCOPES



S-1325 25MHz $349
Dual Trace Oscilloscope

S-1340 40MHz $495
Dual Trace Oscilloscope

S-1360 60MHz
Dual Trace, Delayed Sweep
$775
- Automatic beam finder
- Built-in component tester
- 1mV sensitivity
- Dual time base

B+K OSCILLOSCOPES
2120 - 20MHz Dual Trace $395
2125 - 20MHz Delayed Sweep $539
1541B - 40MHz Dual Trace $749
2160 - 60MHz Dual Trace, Delayed Sweep, Dual Time Base $949
2190 - 100MHz Three Trace Dual Time Base, Delayed Sweep $1,395
2522 - 20MHz / 10MS/s Storage $895
1442 - 20MHz Portable $1,229
1443 - 40MHz Battery / AC operated with Cursor & Readouts $1,499

LOGIC ANALYSERS
- 32 channels (VC-3120) or 48 channels (VC-3130)
- 25MHz synchronous operation on all channels
- 100MHz asynchronous operation (8 or 12 channels)
- 5ns glitch capture capability
- Multi-level trigger sequencing
- Non-volatile data and set-up memories
- Disassembler options for popular uPs
- 9 inch LCD screen
- Call for prices

Hitachi Compact Series Scopes
V-212 - 20MHz Dual Trace $409
V-525 - 50MHz, Cursors $975
V-523 - 50MHz, Delayed Sweep $949
V-522 - 50MHz, DC Offset $849
V-422 - 40MHz, DC Offset $749
V-222 - 20MHz, DC Offset $625
V-660 - 60MHz, Dual Trace $1,095
V-665A - 60MHz,DT, w/cursor $1,325
V-1060 - 100MHz, Dual Trace $1,375
V-1065A - 100MHz, DT, w/cursor $1,649
V-1085 - 100MHz, QT, w/cursor $1,995
V-1100A - 100MHz, Quad Trace $2,195
V-1150 - 150MHz, Quad Trace $2,695

Hitachi RSO Series
RSO's feature; roll mode, averaging, save memory, smoothing, interpolation, pretriggering, cursor measurements.
VC-6023 - 20MHz, 20MS/s $1,650
VC-6024 - 50MHz, 20MS/s $1,950
VC-6025A - 50MHz, 20MS/s $2,350
VC-6045A - 100MHz, 40MS/s Call
VC-6145 - 100MHz, 100MS/s Call

CALL US FOR ALL YOUR COMPONENT NEEDS

Soldering Station
Temperature Controlled
SL-30 $99
Digital Display
Temp Range 300F 900F
Grounded Tip
Overheat Protect

Video Head Tester
HT-200
$44.95
Tells you if VHS head is defective or worn

Digital Multimeter w/ Inductance & Capacitance
$75.00
LCM-1850
Ten Functions
by Elenco

Color Convergence Generator
SG-250
$89.95
Kit $69.95
Finest in the Industry
10 rock steady patterns
RF & video output

12A DC Power Supply
B+K 1686
$169.95
3-14V @ 12A
Fully regulated & protected
Separate volt & current meters with current limiting, low ripple

Triple Power Supply XP-620
Assembled $75
Kit $50
2 to 15V @ 1A,
2 to -15V @ 1A
or 4 to 30V @ 1A)
and 5V @ 3A
All the desired features for doing experiments. Features short circuit protection, all supplies.

The Survivor
Model 2860
$89
B+Ks best DMM
Large 3-1/2 digit
Rugged construction
Full featured

Dual-Display LCR Meter
w/ Stat Functions
Model 878
$239.95
Auto/Manual Range
Many Features
w/ Q Factor
High Accuracy

Multi-Function Counter
Elenco F-1200
1.2GHz
$229
Measures Frequency, Period, Totalize
8 LED digits, Crystal oven oscillator, .5ppm accy

Audio Generator
B+K 3001
$65
20Hz-150KHz
Sine/Square Waves
Handheld

2MHz Function Generator
B+K 3011B $224.95
LED Display, Sine, Square, Triangle, Ramp & Pulse Waves. TTL & CMOS

Digital Multimeter Kit
with Training Course
Elenco Model M-2665K
$49.95
Fun & Easy to Build
Full Function 34 Ranges, Includes Capacitance,Transistor/Diode Testing 20Amp AC/DC, Extra Large Display, Ideal School Project

Learn to Build and Program Computers with this Kit
Includes. All Parts, Assembly and Lesson Manual
Model MM-8000
$129.00
Starting from scratch you build a complete system. Our Micro-Master trainer teaches you to write into RAMs, ROMs and run a 8085 microprocessor, which uses similar machine language as IBM PC

Elenco Wide Band Signal Generators
SG-9000 $129
RF Freq 100K-450MHz AM Modulation of 1KHz Variable RF output
SG-9500 w/ Digital Display & 150 MHz built-in Counter $249

NTSC Generator w/RGB
B+K 1249A $479
NTSC color bars. Excellent for most servicing work. A must

100MHz Portable Frequency Counter
B+K 1803B $179
8 Digit display, battery operation
Selectable gate times, High Accuracy

WE WILL NOT BE UNDERSOLD
UPS SHIPPING: 48 STATES 5%
IL RES 7.5% TAX ($3 min $10 max)
PROBES INCL ALL SCOPES & METERS
C&S SALES INC.
1245 ROSEWOOD DEERFIELD, IL 60015
FAX: 708-520-0085 • (708) 541-0710
15 DAY MONEY BACK GUARANTEE
FULL FACTORY WARRANTY
WRITE FOR FREE CATALOG

CIRCLE 184 ON READER SERVICE CARD

SELL YOUR USED GEAR IN THE *RADIO FUN* FLEA MARKET

CALL JUDY WALKER *TODAY*

1-800-274-7373

what's next?

by Carole Perry WB2MGP

Having Fun at Boxboro

For the past three New England Division Ham Radio Conventions, I've had the privilege of conducting workshops on how to effectively use amateur radio in the classroom. I was especially delighted this year when Rosalie White WA1STO, the head of the ARRL Education Department, asked me to be a participant in the ARRL Educational Workshop held at the Host Hotel in Boxboro, Massachusetts.

The physical outdoor settting for the convention could not have been more perfect. The first weekend in October found the fall foliage at its color peak. The drive from the airport to the hotel allowed me time to soak in and enjoy the myriad of bright golds, oranges, and reds that were in bright profusion along the highways. If you've never been to the convention at Boxboro you should consider making a full weekend out of it so you can enjoy the beauty in that region of the country.

Ham conventions are always fun to go to. You get a chance to meet with people who share your interests and to see lots of the new equipment that the manufacturers have to offer. Rummaging through the flea markets is an activity that many hams especially enjoy and look forward to. But for me, the best time is spent at the forums, meeting folks and hearing about the latest things going on in different aspects of the hobby. Educational workshops are obviously a special highlight for me. In many cases, I have a chance to meet with teachers and recruiters who I've corresponded with or chatted with on the telephone. I truly believe in the sharing-of-information network that these workshops can provide.

The Educational Workshop

The workshop on October 2nd was for evening instructors, volunteer recruiters, and school teachers. It ran from 12 noon to 5 p.m. and offered those in attendance for the whole session a certificate for .5 Continuing Education Units. Each speaker was given 20 minutes for his or her presentation and fielded questions at the end. A very stimulating and informative round-table discussion was held at the end with all the speakers participating.

Bob Maurais KC1IV from Yarmouth, Maine, shared some wonderful classroom lessons from the Yarmouth School SAREX Experiment. His overhead projections and handouts were excellent, providing the rest of us with materials and ideas for using computer tracking and other science and math projects to coordinate with the shuttle flights.

Conrad Ekstrom WB1GXM from Claremont, New Hampshire, was right on target when he held up the *ARRL Instructor's Manual* along with copies of previous ARRL Instructor's Workshop books. These books are an excellent classroom aid and the graphics in them are terrific. Conrad and I have had occasion to speak together before, and I know that he is a dedicated teacher who enjoys sharing information with others. He did a wonderful job in his presentation on Ham Radio Teacher Resources.

Chris Edscorn NØCUH was a most impressive speaker. It was impossible to be in the audience that day and not be touched by what Chris shared with us. Chris is a teacher's aide at the Crotched Mountain Rehabilitation Center, which is a private, nonprofit preparatory school and rehab center serving physically and intellectually challenged students. Chris is from Greenfield, New Hampshire, where over a year ago he approached the center with the idea of forming a radio club to complement the social and educational life of the young people living there. Chris was inspiring to the rest of us as he described how the radio club has opened the door to many of his students who have multiple

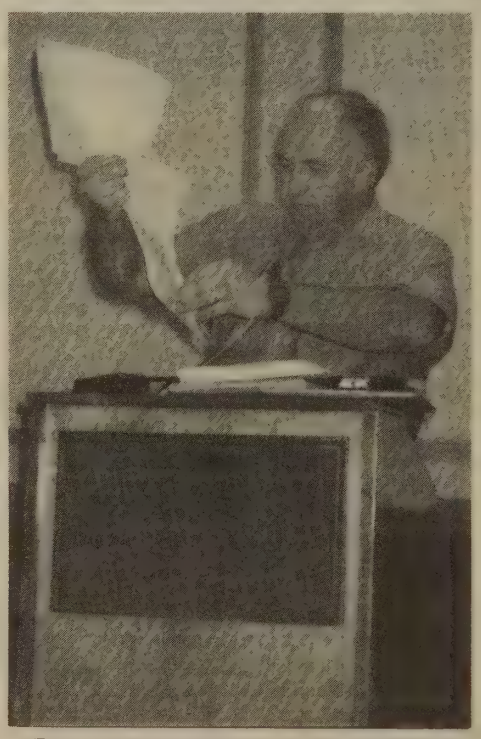


Photo A. Conrad Ekstrom WB1GXM talked about resource materials for ham radio teachers.

Photo B. Kim Burnside N1NIP of the Bethel Educational Amateur Radio Society (BEARS).

disabilities and are now communicating with other people all over the world. The CMARC can be heard on 28.350 MHz from 4:15 to 5:15 p.m. on Wednesdays. You can leave them packet mail via NØCUH @ WB1DSW. NH. USA. NA.

Bob Inderbitzen NQ1R from New Britain, Connecticut, spoke about how teachers and students can prepare for Exam Day. As a new assistant in the ARRL Education Department, Bob reviewed the many ways that this department can serve the needs of teachers. If you want to know more about the educational materials that are available, or where other instructors are located who can help you, just contact the Education Activities Department at 225 Main Street, Newington CT 06111; (203) 666-1541.

Pete Kemp KZ1Z is a teacher at the Bethel Middle School in Bethel, Connecticut. Pete and I have met and spoken together many times during the past few years. We are both in the wonderful position of being able to teach amateur radio in our respective schools on a full-time basis. The Bethel Educational Amateur Radio Society (the BEARS), sponsored by the Technology Education Department of the Bethel Middle School, is designed to provide co-curricular amateur radio activities for youth in the community. Pete delighted the folks in the audience as he described the BEARS' Fox Hunt activity.

The students constructed 2 meter loop antennas and learned foxhunting techniques and (in the end) the importance of attenuators. It took nearly an hour, but the foxes were eventually captured. Common sense helped the winning team in the end. When the signals began to swamp their receivers, they removed their antennas completely and ran around the area, pointing their HTs in all directions. The foxes were hiding in plain sight, in the prone position, their camouflage clothing blending in with their leafy surroundings. The winner actually stepped on the fox when he found it! Pete is certainly a teacher who recognizes the importance of making amateur radio a fun experience for his students.

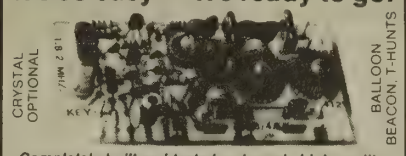
In my own presentation I stressed the importance of convincing school administrators that amateur radio is the perfect tool for a classroom teacher to use to provide highly motivational interdisciplinary lessons. Every area of a school's curricula can be made more exciting via amateur radio. I offered a principal's letter that is available to anyone who drops me a line requesting it. The letter is written by my principal, Ms. Barbara Glassman, to other administrators, stating the reasons why an amateur radio program belongs in every school. Please contact me directly, or write to Ms. Glassman at Intermediate School 72, 33 Ferndale Avenue, Staten Island, New York 10314.

Steve Ford WB8IMY is from Wallingford, Connecticut, and works in the Technical Department at League headquarters. His topic for discussion was how to motivate students of all ages. He stressed the importance of having lots of visuals and exciting props to help get concepts across to the students. Everyone was in agreement with Steve's statement about making sure that there is a follow-up network for the licensed student to go to. This is one hobby that truly depends on the interaction and help of others to provide smooth entry and participation.

It was enlightening and stimulating to be amongst this auspicious group. Even the audience was especially receptive! I also had the pleasure of meeting Miss Tracy Simpson, the very capable assistant to Rosalie White WA1STO, in person that day. Whenever I've spoken to Tracy on the phone, I knew I could count on her to efficiently and cheerfully process whatever had to be done.

My compliments to Rosalie and her fine staff for a job well done! RF

SUPER QRP TRANSMITTER!
It's so easy — It's ready to go!



Completely built and tested, extremely high quality.
- Complete low power CW transmitter
- Up to 2-2½ watts RF output
- Excellent keying characteristics
- 10-16 VDC operation
- Compact, rugged and easy to operate.
- ***Superior QRP world-wide, military grade***

Just connect a battery, antenna, key and plug in your favorite crystal—That's it!—***BEST GLOBAL VALUE***

SW1-15M	**$23.95**	SW1-40M	**$24.95**
SW1-17M	**$23.95**	SW1-80/75	**$26.95**
SW1-20M	**$23.95**	SW1-160M	**$34.95**
SW1-30M	**$23.95**	Metal Case	**$8.95**

Xtals: 21160, 21150, 21060, 18074, 14060, 10115, 10106, 7125, 7110, 7040, 7030, 3700, 3550, 3535 **$5.95 ea**

*To order: Specify meter band desired and include check or money order for correct amount. Also include $2.50 (U.S., Can. & Mex.), $8 all other for first class shipping. PA residents add 6% sales tax to price of unit(s). Foreign orders must send money order drawn on **U.S. correspondent bank** only.*

RYAN COMMUNICATIONS
Box 111E Camelot Rd., Portersville, PA 16051, USA
Phone: (412) 368-3859

CIRCLE 32 ON READER SERVICE CARD

TOLL FREE 1-800-666-0908
PRICING AND ORDERS ONLY

KENWOOD

Full KENWOOD line Radios & Accessories

YAESU

Call for All YAESU Radios & Accessories

ALINCO

Full line of Radios and Accessories

Full line of Radios and Accessories

ICOM

Full ICOM line Radios & Accessories

AEA • ASTRON • COMET • CUSHCRAFT • DIAMOND • KANTRONICS • MFJ • SANGEAN • SONY SHORTWAVE • DRAKE • MANY MORE . . .

NEW EQUIPMENT PRICING AND ORDERS 1-800-666-0908 OUT OF STATE
TECHNICAL, USED GEAR, INFO 203-666-6227 24HR FAX 203-667-3561

LENTINI COMMUNICATIONS INC.
21 GARFIELD STREET NEWINGTON, CT 06111
Hours: M-F 10-6, SAT. 10-4
C.O.D.s OK Same Day Shipping

CIRCLE 234 ON READER SERVICE CARD

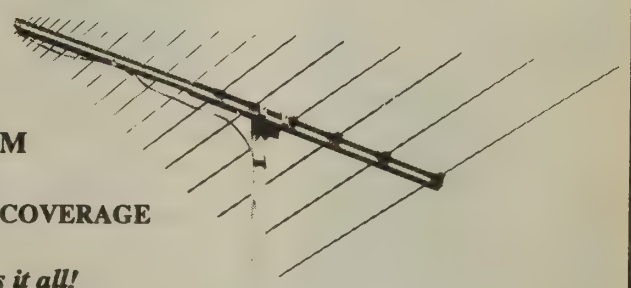
Sell your Product in *RADIO FUN*

****

Call Sue Colbert or Dan Harper TODAY! 1-800-274-7373

EDCO
ELECTRONIC DISTRIBUTORS
325 MILL ST. NE VIENNA, VA 22180
PH 703-938-8105 FX 703-938-6911
Place your order today with your favorite dealer!

CREATE
ONE ANTENNA — ALL VHF AND UHF BANDS!



CLP 5130-1
LP YAGI BEAM
50-1300 MHz
CONTINUOUS COVERAGE

One antenna does it all!

The CLP 5130-1 covers 50, 146, 222, 440, 902, 1296MHz Ham bands, VHF, UHF, 800MHz Public Service bands, Military, Aircraft bands, even complete Television and FM broadcast band coverage!

* Outstanding performance with high forward gain, VSWR below 2.0:1 over entire frequency range!
* Compact and lightweight, all aluminum design, multi purpose horizontal or vertical mounting.
* Extra strong, commercial grade construction withstands the worst weather for unsurpassed reliability.
* Can pass as a conventional TV antenna! Perfect for apartment dwellers, those with limited space or antenna restrictions.
* **Attention Future Hams:** High performance, continuous coverage scanner reception now, all band transmitting beam ant. when you get your ticket!
* Also available: Create model CLP5130-2 LP Yagi Beam with continuous 105-1300MHz coverage in a smaller size.

If you could only have one antenna for complete VHF/UHF coverage, this would be it!

Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 30,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 10 cents a word for individual (noncommercial) ads, and 70 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to *Radio Fun Flea Market*, Judy Walker, 70 Route 202 N, Peterborough NH 03458, and *get set for the phone calls.*

The Deadline for the February 1993 Flea Market is December 21, 1992.

Give the gift of music this holiday season **THE RHYTHM OF THE CODE** morse code music. See ad index to locate our display ad. KAWA PRODUCTIONS, PO Box 319, Weymouth MA 02188. RF247

MINIATURE POLICE RADAR TRANSMITTER one mile range, $41 assembled, $31 kit, (219) 489-1711. P.O. Box 80096, Fort Wayne IN 46898. RF251

WILL SWAP MY SHIPBOARD SOUND POWERED PHONES, (WWII) working order, for your old vintage fountain pens. KB4QGJ, G.J. Rose, 524 N. Quaker Lane, Alexandria VA 22304. 703-370-1880. RF263

HOMEBREW COMPONENTS. Large SASE brings catalog. **KA7QJY COMPONENTS**, Box 3893, Logan UT 84323. RF271

WEATHER INSTRUMENTS. Digital and Traditional. Call for catalog. **THE WEATHER STATION. 1-800-666-7014.** RF280

FREE SHORTWAVE. Convert **any** AM Radio to receive worldband shortwave signals for pennies. Instruction booklet, $10. **ELECTROMAN,** Dept RF, Box 24474, New Orleans LA 70184. RF352

INEXPENSIVE HAM EQUIPMENT. Send stamp for list. WA4DSO, 3037 Audrey Drive, Gastonia NC 28054. RF559

TRADE IBM COMPATABLE SOFTWARE. Ham, Electronics, all areas. Send your list with good description and I'll send mine. Scores of good programs. Donald Wahle N7URL, Box 1244, Jacksonville OR 97530. RF800

2-METER THRU-THE-GLASS ANTENNA. Cellular phone look-alike, all brass and stainless steel, proven design, low SWR, removable for $20.00 PPD or the same antenna with 15 feet of coax and silver PL-259 connector all ready for $26.00 PPD. N8SBP John Swanson, 45075 Mayo Ct., Northville MI 48167> RF808

VIDEOCIPHER /SATELLITE/ SCANNER/ CABLE/ AMATEUR/ CELLULAR. Repair Manuals, Modification Books & Software. Catalog-$3.00. **TELECODE**, P.O. Box 6426-RF, Yuma AZ 85366-6426. RF963

SECRET SCANNER Frequencies: Federal, Police, Aero, Military, Cellular, Surveillance, also SWL & CB Books. Big FREE catalog! **CRB RESEARCH**, Box 56-RF, Commack NY 11725. RF996

AWARDS AND CERTIFICATES FUN. K1BV'S huge directory describes complete rules 2150+ different from 121 countries. $19.40. Ted Melinosky, Box 960, Keene NH 03431-0960. RF997

new products

EUR-AM

EUR-AM has introduced a mobile mount and antenna for meticulous hams. The RF 1123 mount, 25-degree adjustable, has a very small (1-3/8" x 1") footprint. The photo shows a close-up of it with a 144 MHz antenna (52" tall, 3 dB gain); a 144/440 MHz dual-band (17" tall) antenna can also be used with the same mount. Magnetic and 90-degree adjustable mounts are also available.

The price of the 2 meter fiberglas antenna is $51; $38 for black stainless steel. The dual-bander is $49. For more information and a free catalog, contact *EUR-AM, P.O. Box 990, Meredith NH 03253-0990; Fax: (603) 476-5113.* Or circle Reader Service No. 203.

A.S.A.

A.S.A. has introduced a product ideal for new hams—an affordable 2 meter collinear base station antenna with unbelievable gain. The model 9209 is made up of four parts and takes approximately 10 minutes to assemble. The master part is a six-foot vertical fiberglas hand-wound whip covered with heavy black heat-shrink with a 3/8-24 thread ferrell (double 5/8 wave over 1/4 wave). At the top is a three-foot stainless steel whip that is inserted one inch into the top of the whip. At the bottom is a double U-bolt aircraft aluminum bracket that fits up to a 1-1/2" mast with a 3/8-24/SO-239 brass connector for your PL-259. The fourth part consists of three 45-degree aluminum radials, 21" long, attached underneath the bracket with screws. The total height after assembly is 10-1/2 feet.

The model 9209 is priced at $32.43, and will be sent UPS within the continental U.S.A. for $4 S & H. For more information, contact *A.S.A., P.O. Box 3461, Myrtle Beach SC 29578; (800) 722-2681.* Or circle Reader Service No. 204.

ZMAN PRODUCTIONS

"More about Radios" from Zman Productions is an all-new 28-minute video created to show what amateur radio is really all about. It can be used as a recruitment tool, either standing alone or as part of a presentation, without the technical jargon. It is an excellent addition to any school or club library.

The video's on-screen host, M.L. "Gib" Gibson W7JIE, guides the audience from one adventure to another, documenting the events of successful amateur radio clubs and their members for several months. The video introduces easily-understood topics such as radios in an apartment, mobile operation, public service, emergency communications, swap meets and Field Day operations. Considerable attention is given to locating a local ham radio store, clubs, and an Elmer for personal training and assistance. One segment also features children studying to become hams.

"More about Radios" is available for $14.95 plus $3 shipping and handling. For more information, contact *Zman Productions, 8051 N.E. 143rd Street, Bothell WA 98011; (206) 823-8868, Fax: (206) 823-1096.* Or circle Reader Service No. 201.

HART PUBLISHING

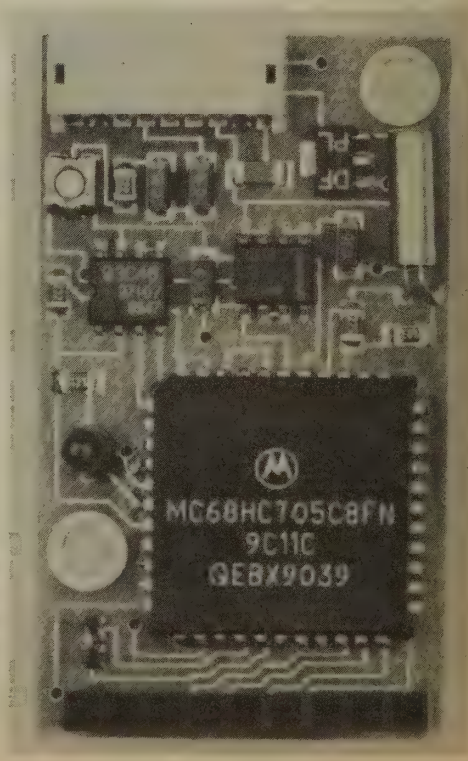
Hart Publishing has released the 1993 *Amateur Radio Mail Order Catalog and Resource Directory.* This is the fifth edition of this catalog and it has 250+ pages, nearly 200 categories, and more than 1,600 entries of mail-order products and services for hams. The catalog is categorized and alphabetized into easy-to-find headings from "Alternative Energy" to "Weather Instruments." Listings include the name, address, phone and fax number of the vendor, plus a description of products or services. And this year the catalog includes "A Library of Tips" from Bill Welsh W6DDB, columnist and author, who has for many years provided the radio newcomer with easy explanations of the jargon and theories of the hobby.

The single issue price is $14.95, plus $3 postage via priority mail. For more information, contact contact *Hart Publishing, 767 South Xenon Court, Suite 117, Lakewood CO 80228; (303) 987-9442.* Or circle Reader Service No. 205.

COMMUNICATIONS SPECIALISTS

The PE-15 from Communications Specialists is a miniature sub-assembly capable of sending 15 separate codes in the POCSAG (RPC-1) format. The PE-15 is intended for operators of local "in-house" radio systems wishing to signal tone-only pagers. It is ideal for factories, restaurants, sales managers, security operations, oil fields, or wherever direct control of local area paging is desired. The 15 available codes may be used to activate up to four distinct alert tones on each pager, 15 individual pagers, or any combination thereof. Communications Specialists also makes the PE-4 four-call and PE1000P 1,000-call POCSAG paging encoders. All of these units can be used on most two-way radio systems, providing enhanced capability of existing systems at low cost.

The PE-15 and PE-4 are factory-programmed to your specific address codes, or may be field-programmed via an available keypad. They each sell for $99.95. For more information, contact *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92665-4296; (714) 998-3021, (800) 854-0547, Fax: (714) 974-3420.* Or circle Reader Service No. 202.



Uncle Wayne's Bookshelf

BOOKS FOR BEGINNERS

20N018 **Technician Class License Manual: New No-Code** *by Gordon West* This book will cover everything you need to become a Technician Class Ham. Every exact question and answer on the examinations is found in this one book covering element 2 and element 3A question pools. Gordon West tells you the right answer and then explains in detail why the answer is correct. Fully illustrated text, frequency chart showing privileges, list of examiners and an FCC Form 610 application. **$9.95**

20N092 **The Wonderful World of Ham Radio** *by Richard Skolnik, KB4LCS* This book addresses the plea that something simple, clear, and fun be written to introduce young people to amateur radio. Pick one up for the new ham in your life. **$7.95**

20N099 **Digital Electronics Projects for Beginners** *by Owen Bishop* contains 12 digital electronics projects suitable for the beginner to build with the minimum of equipment. 128 pp., 56 line drawings **$12.50**

20N100 **Electronics Build and Learn (2nd Ed.)** *by RA Penfold* combines theory and practice so that you can "learn by doing." Full construction details of a circuit demonstrator unit that is used in subsequent chapters to introduce common electronic components. Describes how these components are built up into useful circuits, oscillators, multivibrators, bistables, and logic circuits. 128 pp., 18 photos, 72 line drawings. **$12.50**

AR2073 **Novice Antenna Notebook** A beginners guide to easy and effective antennas and tuners you can build. **$9.50** An ARRL Publication.

AR2871 **W1FB's Help for New Hams** *by Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **$10.00** An ARRL Publication.

AR2286 **First Steps in Radio** *by Doug DeMaw W1FB* Series of *QST* articles. See components assembled into practical circuits and how the circuits make up your radio gear. **$5.00** An ARRL Publication.

AR3291 **Now You're talking: Discover the World of Ham Radio** Successor to the immensely popular *Tune in the World with Ham Radio*. Covers everything you need to know to earn your first Amateur Radio license. More than a study guide, this book will help you select equipment for your ham radio station and explain how to set it up — everything you'll need to know to get on the air! An ARRL Publication. **$19.00**

AR3292 **Your Introduction to Morse Code: Practice Cassettes** companion code course to *Now You're Talking!*, this kit includes two 90 minute cassette tapes. Prepares you for the 5 WPM Morse Code exam to earn your Novice license or add high-frequency worldwide communications privileges to your code-free Technician license. **$10.00**

20N021 **No Code Ham Radio Education Package** Computer software package. Clear, concise. and easy to understand. This package includes computer aided instruction software (IBM compatible), 200 page Ham Radio Handbook, and complete FCC Part 97 Amateur Radio rules and regulations. No prior knowledge of electronics is needed. **$28.95**

20N022 **Ham Operator Education Package** Computer software contains five IBM compatible discs with all questions for all license classes, plus "Morse Academy" code teaching software that takes you from 0-20 wpm. Effortless and uncomplicated, everything is done from easy to understand menus. Review all questions, print out sample tests or take exams administered right at the computer keyboard. **$28.95**

SHORTWAVE

06S57 **1992 Passport to World Band Radio** *by International Broadcasting Services, Ltd.* You can have the world at your fingertips. You'll get the latest station and time grids, the 1992 Buyer's Guide and more. 384 pages. **$16.50**

07R25 **The RTTY Listener** *by Fred Osterman* New and expanded version. This specialized book compiles issues 1 through 25 of the *RTTY Listener Newsletter*. It contains up-to-date, hard-to-find information on advanced RTTY and FAX monitoring techniques and frequencies. 224 pages. **$19.95**

09S42 **The Scanner Listener's Handbook** *by Edward Soomre N2BFF* Get the most out of your scanner radio. Covers getting started, scanners and receivers, antennas, coaxial cable, accessories, computer controlled monitoring, more. **$14.95**

03S208 **Radioteletype Press Broadcasts** *by Michael Schaay* Covers schedules of Press Services by time, frequency, and country broadcasting in English, French, German, Spanish, and Portuguese. Detailed Press Agency Portraits. 120 pp. **$12.95**

03K205 **Guide to Radioteletype (RTTY) Stations** *by J. Klingenfuss* Updated book covers all RTTY stations from 3MHz-30MHz. Press, Military, Commercial, Meteo, PTTs, embassies, and more. 105 pp. **$12.95**

11RF13 **The "Top Secret" Registry of US Government Radio Frequencies (7th Ed.)** *by Tom Kneitel K2AES* This scanner directory has become the standard reference source for frequency and other important information relating to the communications of federal agencies. 25 to 470 MHz. **$19.95**

11F52 **Ferrell's Confidential Frequency List, New Revised Edition** *compiled by A.G. Halligey* All frequencies from 4 MHz-28MHz covering ship, embassy, areo, Volmet, Interpol numbers, Air Force One/Two, more. 376 pp. **$19.50**

11EE06 **Guide to Embassy Espionage Communications** *by Tom Kneitel K2AES* Candid and probing examination of worldwide embassy and (alleged) espionage communications systems and networks. Extensive nation-by-nation directory of embassy stations is included. **$10.95**

STUDY AIDS

VIS Study Cards
Advance the easy way with VIS Study Cards. Compact. Up-to-date Flash Cards with Key Words Underlined, Quiz on back. Formulas worked out. Schematics at your fingertips. Used SUCCESSFULLY by ages 6 to 81!

NOVICE	VIS01	**$11.95**
TECH	VIS02	**10.95**
GENERAL	VIS03	**9.95**
ADVANCED	VIS04	**15.95**
EXTRA	VIS05	**14.45**

Lanze Code Programs—(Available on 5 1/4" disk.) Inexpensive complete study guide code programs for both the C64/128 Commodores and the IBM compatibles. Programs include updated FCC questions, multiple choice answers, formulas, schematic symbols, diagrams, and simulated (VE) sample test.

	IBM Part#	Commodore Part#	Price
Novice	IBM01	COM01	**$14.95**
Tech	IBM02	COM02	**$14.95**
General	IBM03	COM03	**$14.95**
Advance	IBM04	COM04	**$19.95**
Extra (New Pool)	IBM05	COM05	**$19.95**

IBM06, COM06 IBM/Commodore Tech No Code—Lanze Code Program contains all the authorized FCC questions and answers used in testing formulas, schematic symbols, diagrams, and sample test for passing the new Technician No Code license. **$24.95**

ANTENNAS

05A95 **Easy-up Antennas for Radio Listeners and Hams** *by Edward M. Noll* Like to learn how to construct low-cost, easy-to-erect antennas? *Easy-up Antennas* will help you. **$16.50**

10A345 **Beam Antenna Handbook** *by William Orr W6SA1/Stuart Cowan W2LX* Yagi beam theory, construction, operation. Wire Beams, SWR curves. Matching systems. A "must" for serious DXers. **$11.95**

10A343 **All About Cubical Quad Antennas** *by William Orr W6SA1/Stuart Cowan W2LX*The "Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$9.50**

10A346 **Simple, Low-cost Wire Antennas for Radio Amateurs** *by William Orr W6SA1/Stuart Cowan W2LX* All New! Low-cost, multi-band antennas; inexpensive beams. "Invisible" antennas for hams in "tough" locations! New data. **$11.50**

01A70 **Practical Antenna Handbook** *by Joseph J. Carr* Design, build, modify, and install your own antennas. Carr, a 20-year veteran of technical writing, has a unique ability to present complex technical concepts in an easy-to-understand way. 416 pp. **$21.50**

20N108 **The Easy Wire Antenna Handbook** *by Dave Ingram K4TWJ* Get out your roll of wire and your wire cutters, you are ready to go with this new practical and easy to understand book. Gives you all of the needed dimensions for a full range of easy to build and erect "sky wires." Covers all of the many types of wire antennas along with a lot of his antenna secrets and "how-to-do" helps. **$9.50**

UHF/VHF PACKET

03R02 **RTTY Today** *by Dave Ingram K4TWJ* Only up-to-date RTTY book in existence. Covers all facets of RTTY. Most comprehensive RTTY guide ever published. Fully illustrated. 112 pages. **$8.50**

01P22-2 **The Packet Radio Handbook (2nd Ed.)** *by Jonathan L. Mayo KR3T* "...an excellent piece of work. Well worth reading for both the experienced and the new packeteer...the definitive guide to amateur packet operation."—Gwyn Reedy W1BEL **Only $15.00**

20N019 **U.S. Repeater Mapbook** *by William Smith N6MQS* The Guide for traveling radio amateurs gives you repeater frequencies, and locations on easy to read state map. Includes all 50 states and 28—1200 MHz. **$9.95**

ARRL BOOKS

AR1992 **ARRL 1992 Handbook (68th Ed.)** 39 chapters, featuring 2,100 tables, figures and charts. The most comprehensive, well organized and affordable source of amateur radio reference material. 1232 pages. **$25.00**

AR1086-4 **ARRL Operating Manual (4th Ed.)** Packed with information on how to make the best use of your station, including: interfacing home computers. OSCAR, VHF-UHF, contesting **$17.00**

AR0194 **Antenna Compendium Vol. 1** Materials on verticals, quads, loops, yagis, reduced size antennas, baluns, Smith Charts, antenna polarization, and other interesting subjects. **$10.00**

AR2545 **Antenna Compendium Vol. 2** 42 papers covering verticals, yagis, quads, multiband and broadband systems, antenna selection, and much more. **$12.00**

AR2626 **Companion Software for Antenna Compendium Vol. 2** 5 1/4" MS-DOS floppy. **$10.00**

AR0488 **W1FB's Antenna Notebook** *by Doug DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$9.50**

AR0348 **QRP Notebook** *by Doug DeMaw W1FB* Presents construction projects for the QRP operator, from a simple 1 watt crystal-controlled transmitter to more complex transceiver designs. **$9.50**

AR4141 **W1FB's Design Notebook** *by Doug DeMaw W1FB* This plain language book is filled with simple practical projects that can be built using readily available components and common hand tools. **$10.00**

AR1033 **The DXCC Companion** *by Jim Kearman KR1S* spells out in simple, straightforward terms what you need to be a successful DXer. **$6.00**

ARRL License Manuals All the theory you need to pass your test. Complete FCC question pools with answers.

AR2375 **Technician Class**	$6.00
AR2383 **General Class**	$6.00
AR0166 **Advanced Class**	$6.00
AR2391 **Extra Class**	$8.00

AR2171 **Hints and Kinks** Find the answer to that tricky problem. Ideas for setting up your gear for comfortable, efficient operation. **$8.00**

AR3169 **QRP Classics** Collection of articles from last 15 years of ARRL publications on building receivers, transmitters, transceiver, accessories, 288 pp. **$12.00**

AR2030 **Your Gateway to Packet Radio (2nd Ed.)** Tells everything you need to know about this popular new mode; how to get started, equipment you need, and more. **$12.00**

AR2065 **ARRL Antenna Book** The new 16th Edition represents the best and most highly regarded information on antenna fundamentals, transmission lines, design, and construction of wire antennas. Over 700 pages, over 900 figures. An ARRL Publication. **$20.00**

We carry all ARRL books. Call for Prices!

CODE TAPES

73T05 **"Genesis" $5.95**
5 wpm—This is the beginning tape, taking you through the 26 letters, 10 numbers, and necessary punctuation, complete with practice every step of the way.

73T06 **"The Stickler" $5.95**
6+ wpm—This is the practice tape for those who survived the 5 wpm tape, and it's also the tape for the Novice and Technician licenses.

73T13 **"Back Breaker" $5.95**
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per.

73T20 **"Courageous" $5.95**
20+ wpm—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per.

REFERENCE

20N101 **Everyday Electronics Data Book** *by Mike Tooley BA.* Information is presented in the form of a basic electronic recipe book with numerous examples showing how theory can be put into practice using a range of commonly available "industry standard" components and devices. 256 pp. 134 line drawings. **$18.00**

02C30 **The Commodore Ham's Companion** *by Jim Grubbs K9E1.* 160 pages of useful information on selecting a Commodore computer for the ham shack, where to find specialized programs, the Commodore-packet connection, and more! **$9.50**

10F092 **1992 International Callbook** The New 1992 International Callbook lists 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions. **$29.95**

10D092 **1992 North American Callbook** The 1992 North American Callbook lists the calls, names, and address information for over 500,000 licensed radio amateurs in all countries of North America, from Panama to Canada including Greenland, Bermuda, and the Caribbean islands plus Hawaii and U.S. possessions. **$29.95**

05H24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SA1* 840 pages of everything you wanted to know about radio communication. In-depth study of AC/DC fundamentals, SSB, antennas, amplifiers, power supplies, and more. **$29.50 hard cover only.**

01D45 **The Illustrated Dictionary of Electronics, 5th Ed.** *by Rufus P. Turner and Stan Gibilisco.* Featuring more than 27,000 entries, an exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables, this is by far the most comprehensive dictionary of practical electronics and computer terms available. 720 pages **$26.95**

02B10 **Heath Nostalgia** *by Terry Perdue K8TP* A brief history of the Heath Company of Benton Harbor, Michigan - with fond memories of and by those who were responsible for the Heathkit name becoming world famous.**$9.50**

04M54 **GGTE Morse Tutor** From beginner to Extra class in easy self-paced lessons. Code speeds from 1 to over 100 words per minute. Standard or Farnsworth mode. Adjustable tone frequency. Create your own drills, practice or actual exams. Exams conform to FCC requirements. 5 1/4 floppy for IBM PC, XT, AT, PS/2 or compatibles. **$19.50**

04M55 **Advanced Edition $29.95**

IBM97 **Amateur Radio Part 97 Rules** Includes updates, revised Commissions's Rules, (September 30, 1989) 5 1/4" disk IBM compatible only. **$9.95**

20N096 **How To Read Schematics (4th Ed.)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. This book is your key to unlocking the mysteries of schematics, beginning with a general discussion of electronic diagrams. **$14.95**

20N097 **Radio Operator's World Atlas** *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed as a constant desk top companion for radio operators, and as a replacement for the traditional bulky and outdated atlases. Also included are 42 pages of vital statistics about each country. Popular with DXers worldwide. **$17.95**

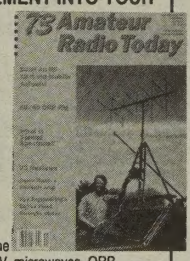
20N020 **Secrets of RF Circuit Design** *by Joseph J. Carr* Written in clear non-technical language, covers everything from antennas to transistors. You will learn the basics of receiver operation, the proper use and repair of components in RF circuits, the principles of radio signal propagation from low frequencies to microwave, and much more! **$19.50**

20N109 **73 Magazine Index 1960-1990** A complete index to every article published in *73 Magazine* through 1990. Eleven major categories, further subdivided into 25 individual subject areas, provides easy access to thousands of articles, and a wealth of technical information. Book**$15.00**
IBM software (specify type) $20.00

20N110 **Product Reviews Since 1945** Contains an index to 3,400 product reviews that have appeared in *QST, CQ, HR, 73* and *Radcom*. Alphabetically listed by manufacturer. Book **$12.95**

73 Amateur Radio Today

PUT SOME EXCITEMENT INTO YOUR HOBBY!!



No other magazine brings you the exciting world of amateur radio like *73 Amateur Radio Today.*

Equipment reviews you can use. Construction projects for all abilities. More antenna articles than any other magazine. Monthly columns covering the exciting worlds of RTTY, ATV, microwaves, QRP, DX, foxhunting and more. "Never Say Die," Wayne Green's monthly view of the world of amateur radio.

12 issues for $19.97 That's a 43% savings off the newsstand price!
CALL 1-800-289-0388
or send $19.97 to: *73 Amateur Radio Today*
70 Rte. 202N, Peterborough, NH 03458

Uncle Wayne's Bookshelf Order Form

You may order by mail telephone, or fax. All payments are to be in US funds. Allow 3 weeks for delivery.

Item #	Title	Qty.	Price	Total
			SHIPPING	
			TOTAL	

Shipping
US add $3.00 mail, $4.00 UPS
Canada add $4.00 mail.
UPS to Canada and all foreign orders FOB Peterborough, NH.
Foreign orders will be billed actual shipping charges.

Name _____

Street _____

City _____ State _____ Zip _____

TOTAL $_____ ❑AE ❑MC ❑VISA ❑Check/Money Order

Card # _____ Expiration Date _____

RF1292

Telephone: (603) 924-4196 (800) 234-8458 FAX: (603) 924-8613
Mail: *73 Magazine*, Attn. Uncle Wayne, PO Box 3080, Peterborough, NH 03458

THE FAMED 2 METER
A. S. A. 9209

+9 db Co-Linear "MultiWave" Base Station Double 5/8 over 1/4 wave delivers up to +9 db gain. All fiberglass & solid aluminum construction. Fits masts up to 1-1/2". 2 Meter Base Station 10' length.

$32.43
+$4.00 S&H
(SC RES. 5% SALES TAX)
CHECK IN ADVANCE OR C.O.D.
ALSO AVAILABLE IN 220 & 440

ASA

"Service is the Reason For Our Success"

Model 9209
+9db

Tel: (803)293-7888 P.O. Box 3461
Watts: 1-800-722-2681 Myrtle Beach, SC 29578

CIRCLE 18 ON READER SERVICE CARD

$ BEST PRICES ON **PC PARTS** $
COMPLETE LINE OF COMPONENTS

MOTHER BOARDS		HARD DRIVES	
386SX-25	$139	IDE106 Mb	$289
386DX-40	$259	IDE 130 Mb	$329
486DLC-33	$499	IDE 213 Mb	$429
1.2 Fdd	$57	1.44 Fdd	$52
250 Mb tape back up int.			$249

CALL FOR OTHER PRICES
JLP
COMPUTERS & ELECTRONICS
2895 Pontiac Lk. Rd.
Waterford, MI 48328
1-800-497-9735
MasterCard VISA

CIRCLE 84 ON READER SERVICE CARD

DF Kits

DF Yagi
$14.95
A hand-held 3 element yagi with better F/B ratio than ANY quad!

DF Attenuator
$19.95
100 dB. variable attenuator

COMING SOON!
Doppler DF Kits

Please add $4 shipping & handling

Douglas RF Devices
P.O. Box 246925
Sacramento, CA 95824
916 688-5647

Direction Finding!

CIRCLE 239 ON READER SERVICE CARD

Subscribe To
Radio Fun
Call
1-800-257-2346

updates

Trap Dipoles

Refer to the above article by Dean Frazier NH6XK on page 4 of the December 1992 issue. The value of the trap capacitors should be 100 pF instead of 10 pF as shown in Figure 1 in the original article. RF

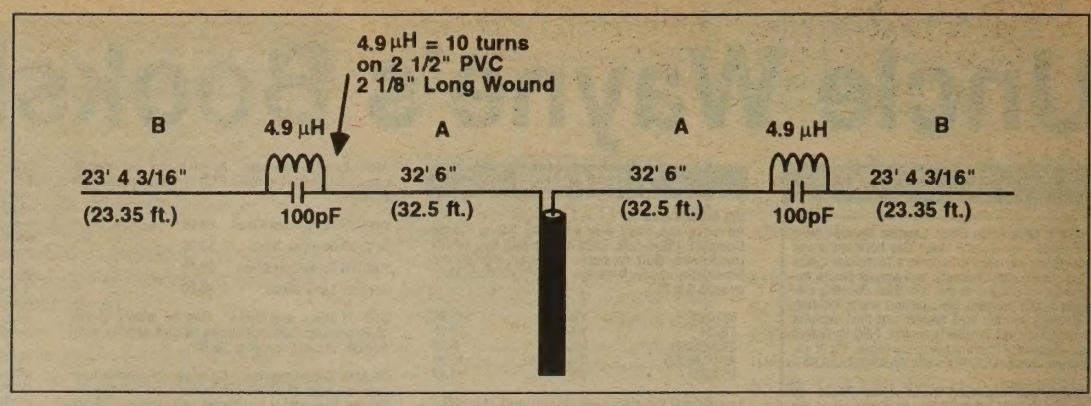


Figure. The corrected diagram for the 80-10 meter trap dipole. Note that the trap capacitors should be 100 pF.

New AMSAT Video

"AMSAT's Phase IIID Satellite," a new 10-minute video co-hosted by retired NBC newsman Roy Neal K6DUE, U.S. Senator Barry M. Goldwater K7UGA, and AMSAT-NA Director of Development Joe Schroeder W9JUV, is now available for club showing. Taped on location at the Goldwater Ranch in Scottsdale, Arizona, and produced by the same team that brought out the award-winning "New World of Amateur Radio," this program is designed to introduce the proposed new ham satellite to the vast majority of amateur radio operators who have never tried satellite work. Viewers get to see a mock-up of the Phase IIID bird, learn about the concept behind the new satellite, get a simple and concise explanation of how it will operate once in orbit, and are given insight into how a project of this magnitude is funded. Loan-out copies are available free of charge by writing to: AMSAT Phase IIID Video, AMSAT-NA Video Dept., P.O. Box 406, Glenview IL 60025. *TNX Westlink Report, Number 638, November 27, 1992.*

Hiram Hamilton Maxim Dies

ARRL founder Hiram Percy Maxim's son has died. Hiram Hamilton Maxim, 92, died November 2nd in Simsbury, Connecticut. "Ham," as he was called, was the widower of Alison Heminway Maxim, who died in 1990. Ham graduated from the Massachusetts Institute of Technology in 1921, returned home to work for his father, and took over the Maxim Silencer company when HPM died in 1936. He leaves a son, Hiram Percy Maxim II, and a daughter-in-law, a sister, and three grandchildren. A memorial service was held November 7th. *TNX Westlink Report, Number 638, November 27, 1992.*

ARRL Says "Yes" to Novice VE Tests

The ARRL has filed reply comments on an FCC Notice of Proposed Rule Making (in PR Docket 92-154) that would have Novice class license examinations be administered only by the Volunteer Examiner Coordinator (VEC) program, which now administers all other license class exams. The League sought to address concerns about the availability of examination opportunities in sparsely populated areas and to clarify that General class licensees would be eligible to administer Novice exams within the VE system.

At the time of the NPRM, the FCC noted its burden in dealing with an application error rate of 9.4 percent for Novices, as compared to only 0.8 percent for VE-administered examinations, and said it believed that bringing Novice exams under the VEC system would be in the public interest, saying the VEC system "has demonstrated both its efficiency and its integrity."

The League noted that its original proposal, similar to the FCC's NPRM, was based on three conclusions:

1. Since the elimination of the Morse code requirement from the Technician class license, the number of Novice examinations has decreased;

2. That the VEC program is capable of assimilating Novice examinations;

3. That the large number of new Technician class licensees in 1992 in particular indicates that examinations are, in general, widely available.

The League concluded that there is no longer justification for having a different system for Novice examinations because the Novice class is now one of two entry-level license classes (the Technician class already is VEC-administered) and that the Novice class includes many more operating privileges than it did when the subject was last considered, in 1983. *TNX KY1T; Westlink Report, Number 638, November 27, 1992.* RF

MAXCOM®

"The ONLY, Absolutely, Completely, Fully, No Adjustment, Install It, Forget It, Works Even in Receive, All Frequency, Tougher than Lightning, Works Forever, Waterproof, Automatic Antenna Matcher"!!!

OVER 7,000 MAXCOM® STATIONS WORLDWIDE
THE BOTTOM LINE: "MAXCOM® WORKS".

P.O. Box 502
Fort Lauderdale • Florida 33302
Phone: 305-523-6369 • Fax: 305-522-8159

CIRCLE 101 ON READER SERVICE CARD

HELPING HAMS GET ON THE AIR! SINCE 1933

INFORMATIVE STARTER KIT INCLUDES:
- Novice and Tech Written Element Study Guide
- Practice Key and Oscillator
- Code Practice Cassette Tapes
- Theory Tapes
- FCC Rule Book
- Valuable Coupons Good Toward the Purchase of Ham Radio Equipment

PACKAGE PRICE – $59.95

WHETHER YOU'RE AN "O.M." OR JUST A "NOVICE," QUEMENT IS SURE TO MEET ALL YOUR NEEDS!

QUEMENT ELECTRONICS
PHONE (408) 998-5900
1000 S. BASCOM AVENUE • SAN JOSE, CA 95128

FEATURING LINES BY:
ICOM
YAESU U.S.A.
ALINCO
AND THOUSANDS OF ACCESSORIES!

CIRCLE 132 ON READER SERVICE CARD

FT-990
All-Mode HF Transceiver

- **Frequency Coverage:** 100 kHz – 30 MHz RX (160-10 m TX)
- Built-in Dual Digital Switched Capacitance Filters
- Built-in High Speed Antenna Tuner w/39 Memories
- RF FSP (RF Frequency-Shifted Speech Processor)
- Dual VFOs with Direct Digital Synthesis (DDS)
- 90 Memories which store Frequency Mode and Bandwidth
- Full and Semi Break-in CW Operation
- Band Stacking VFO System
- Multi-mode Selection on Packet/ RTTY; Easy interface to TNCs
- Adjustable RF Power
- Variable Threshold Noise Blanker
- Optional Digital Voice Recorder (DVS-2)
- Front Panel RX Antenna Selection
- **Accessories:**

FT-990DC	Available without power supply
XF-10.9M	2nd IF SSB Narrow 2.0 kHz Filter
XF-445K	2nd IF CW Narrow 250 Hz Filter
TCXO-2	High Stability TCXO
SP-6	External Desk-top Speaker
MD-1C8	Desk Microphone
DVS-2	Digital Voice Recorder Unit
YH-77ST	Lightweight Headphones
LL-5	Phone Patch Unit for SP-6 Speaker

"Yaesu did it again!'

"This is the only HF rig with a dual digital SCAF. It's incredible on a crowded band. Look inside, motherboard and plug-in board design. Un-be-liev-able!"

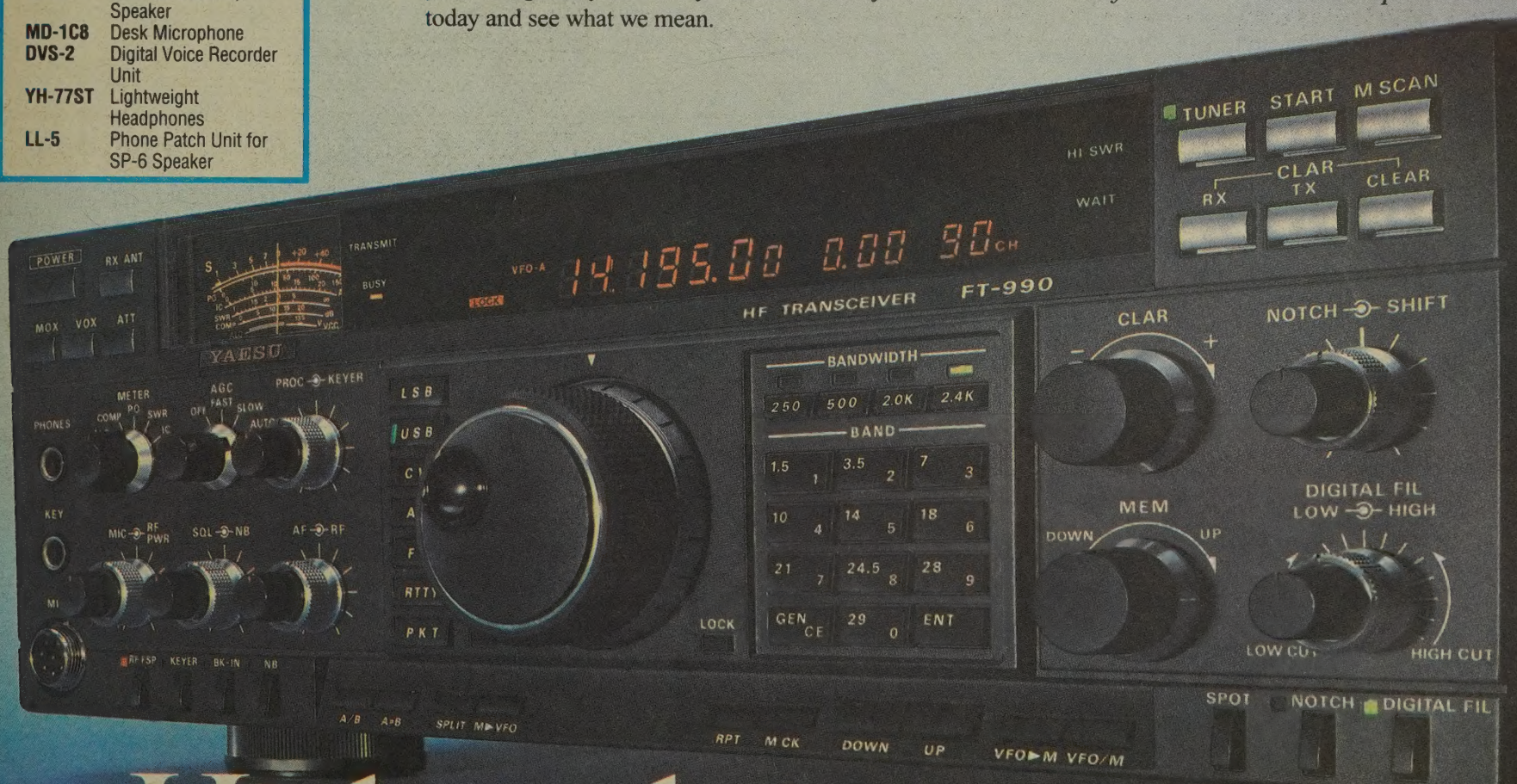
The innovative technology of the FT-990 is inside, not outside. Like the exclusive dual digital SCAF (Switched Capacitance Audio Filter). And for long term reliability, the motherboard/plug-in module construction eliminates inter-board wiring. The FT-990 also has the same undisputed receiver performance of the FT-1000 as well as other features such as a high-speed, built-in antenna tuner with automatic storage. And, multiple DDS (Direct Digital Synthesis) for quick lock-up time and low level noise. What's more, for maximum efficiency, the FT-990 is a self-contained base station with its space-saving, built-in AC power supply.

Outside, the very functional HF front panel is simple and uncluttered with a large amber display. Easy to use, easy to see. Pure and simple QSO enjoyment – with muscle when you need it! Yaesu makes "high-tech" effortless. Now it works for you, not against you. Have your dealer show you the FT-990 today and see what we mean.

FT-990DC now available. NEW

YAESU

Performance without compromise.℠

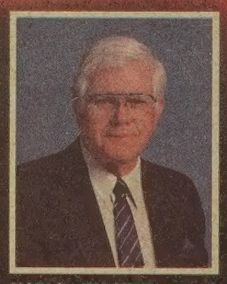


High-tech innovation isn't miniature knobs, switches, and tiny labels.

© 1992 Yaesu USA, 17210 Edwards Road, Cerritos, CA 90701 (310) 404-2700

Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.

3 GREAT REASONS TO BUY THE AZDEN PCS-7000H



Sid Wolin, K2LJH, Manager of Azden Communications Division

1. ULTRA WIDE BAND RECEPTION
2. TRUE FM MODULATION
3. 50 WATTS OF POWER

Now, for the first time, you can buy an Azden transceiver directly from the factory! This means that you will receive the level of knowledge and expertise that you want when buying a radio. It also means that you'll have competent technicians, ready to handle your service needs — quickly and efficiently!

Transmit
- 144-148 MHz plus CAP and MARS (when modfied)
- 50 Watts/10 Watts-adjustable
- All 57 subaudible tones
- True FM modulation (great for packet)

Receive
- 118-135.995 MHz AM, 136-174.995 MHz FM
- Amateur, CAP, MARS, Weather, Marine, Public Service
- Sensitivity less than 0.19 µV for 12dB SINAD
- Patented discriminator center frequency tuning
- 2 Watts audio output

Other Features
- Frequency reverse
- 20 Memory channels in two banks
- One temporary memory channel
- Programmable frequency steps (5, 10, 15, 20KHz)
- Priority channel monitoring
- Lighted DTMF microphone
- Size: 2"H x 5-1/2"W x 7-1/2"D
- Mobile mounting bracket and power cord included

"Now Available... 2, 6 & 10m Handhelds!"

NEW 2 YEAR LIMITED WARRANTY

To Place Orders: 1-800-643-7655

For Technical Assistance: 516-328-7501
Fax Number: 516-328-7506

MasterCard VISA

AZDEN®
COMMUNICATIONS DIVISION
147 New Hyde Pk. Rd., Franklin Sq., NY 11010

CIRCLE 92 ON READER SERVICE CARD